



U.S. Army Corps
of Engineers
Seattle District

Centralia Flood Damage Reduction Project Chehalis River, Washington General Reevaluation Study

**Final Environmental Impact Statement
Part 2, Chapters 5-12
June 2003**

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APPENDICES

Appendices are available on the enclosed CD-ROM

APPENDIX A – FISH, RIPARIAN, AND HABITAT STUDY

APPENDIX B – SKOOKUMCHUCK DAM RE-OPERATION REPORT

APPENDIX C – WETLAND AND RIPARIAN SURVEY

APPENDIX D – HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

APPENDIX E – BIOLOGICAL ASSESSMENT

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5. MITIGATION

Once the preferred alternative was selected, it was necessary to identify a suitable mitigation plan. Within the GRR/EIS process, a number of potential restoration plans were developed, which could also be used as mitigation. The Corps has selected the Scheuber Ditch/SR-6 mitigation plan to compensate for habitat losses associated with the construction of levees. The objective of this chapter is to evaluate the Scheuber Ditch/SR-6 mitigation plan to determine its suitability to mitigate for loss of wetland and riparian habitat throughout the levee footprint. If necessary, the selected mitigation plan may also be reconfigured in Preconstruction Engineering and Design (PED) to ensure optimum and appropriate mitigation levels.

Evaluation of the mitigation plan was accomplished through the use of the habitat evaluation methodology previously described in the GRR/EIS. However, the evaluation methodology was modified specifically to evaluate the types of impacts associated with the selected flood control alternative. Modifications made to and details of using the evaluation methodology are provided below.

Evaluation of results from the previous application of the habitat evaluation methodology (referred to in this chapter as the “Original Method”) as documented in the GRR/EIS resulted in the finding that the Scheuber Ditch/SR-6 mitigation plan likely overcompensated for habitat losses associated with the setback levee construction and included elements that are out-of-kind of the type of impacts expected (proposed mitigation included extensive side channel habitat). As a result, the mitigation plan is reconfigured as documented in this chapter to more appropriately address necessary mitigation needs as quantified in a modified evaluation methodology (hereafter referred to as “Modified Method”). The reconfigured plan, referred to as the Oxbow/SR-6 mitigation plan, includes the following components: (1) connection of the mainstem Chehalis River to an oxbow near the intersection of SR-6 and South Scheuber Road, (2) connection of an unnamed tributary that flows beneath South Scheuber Road to the oxbow, (3) modification of SR-6 to a bridge where the new channel passes beneath the road, (4) the creation of 68 acres of wetlands along the length of the new channel, west of SR-6, and (5) creation of 20 acres of riparian buffer around the wetland.

The plan views and cross sections are provided as attachments to this chapter and show the aerial view of the proposed mitigation plan. Quantities for excavation were derived from these drawings, and combined with unit cost assumptions, were the basis for the cost estimate. The

Corps MCACES cost estimating software package was used to develop a cost estimate for the mitigation plan. The total cost of the selected mitigation plan is \$9,783,777.

5.1 BACKGROUND

5.1.1 Preferred Flood Reduction Alternative

The preferred alternative includes the construction of levees, modifications to the Skookumchuck Dam, and several non-structural components. Specifically, the following components will be included in the selected alternative:

1. Levee construction of 100-year level protection on the Chehalis River using both earthen levees and floodwalls;
2. Levee construction of 100-year level protection along the Skookumchuck River and Salzer and Dillenbaugh Creeks;
3. Modified Outlet Works and New Gates on the Spillway at Skookumchuck Dam for the addition of 20,000 ac-ft of flood control storage;
4. Non-structural features including elevation of structures that would incur increased inundation as a result of the project to mitigate for induced damages. The local sponsor is updating 100-year FEMA floodplain mapping, improving a flood warning system, along with continued restriction of development within the floodplain, continued restriction of fill in the floodplain, and institution of storm water management controls.

5.1.2 Impacts of Selected Flood Damage Reduction Plan

Initial evaluation indicates that a number of acres of wetland and a small portion of riparian habitat would be eliminated as a result of levee construction. Wetlands within the levee footprint are predominantly emergent wetlands, and their quality was evaluated using the modified evaluation methodology described in the following section of this chapter. The current estimation of wetland impacts is based on limited groundtruthing and the use of aerial photographs and hydric soils maps. Complete USACE wetland delineations and a functional assessment will be completed along the entire length of the proposed levee alignment, where hydric soils are present, prior to further design of this mitigation plan. At this time, it is estimated that these wetlands would be either Class III or Class IV wetlands (per the Washington State Wetlands Rating System (WDOE 1993) which are of low to moderate habitat quality. The

selected Oxbow/SR-6 mitigation plan presented in this chapter is intended to mitigate for the estimated loss of 102.1 habitat units (HUs) provided by the 34 acres of Class III or IV wetlands. Additionally, 108 acres of 2-year floodplain wetlands would be isolated from flood flows because of the construction of the levees. While it does not appear that the only source of hydrology for these wetlands is flood flows, the loss of this component of hydrology will adversely affect these wetlands. The quality score for the remaining wetlands is thus reduced.

While these effects on low to moderate quality wetlands and some riparian habitat appears to be moderate, it is estimated to result in a significant loss of groundwater recharge and other biogeochemical functions (such as sediment retention, pollutant retention and uptake, etc.). The loss of these types of functions is extremely important to the regulatory agencies involved in the study's Restoration Working Group. A major issue in the Chehalis River basin is the loss of floodplain storage, groundwater recharge, and chemical and sediment retention. The cumulative loss of these functions has significantly contributed to the poor water quality and quantity conditions in the river and its tributaries and has significantly reduced accessibility and habitat for resident and anadromous salmonids and other native fish species.

5.1.3 Selected Mitigation Plan

An incremental cost analysis (ICA) was conducted on the alternative restoration measures to determine which specific components of the mitigation plan provided the most habitat benefits (as quantified by the original habitat evaluation methodology as documented in the GRR/EIS) for the least cost. The most cost effective configuration of the plan included the connection of Scheuber Ditch to the mainstem Chehalis River via the oxbow near SR-6. Components of this configuration also included re-meandering of the Scheuber Ditch and creation of wetlands at the downstream confluence of the ditch and the mainstem Chehalis. However, the final configuration of the mitigation plan has been changed as a result of the Modified Method analysis. The process by which the original mitigation plan was reconfigured into the currently selected plan is described in the following sections.

5.2 MODIFIED EVALUATION METHODOLOGY

5.2.1 Mitigation Requirements

As previously stated, the total loss of wetlands is estimated to be 34 acres, based on the current level of delineation that has been completed. As a starting point for developing the mitigation plan, we utilized a 2:1 replacement mitigation ratio for the 34 acres of wetland habitat that would be eliminated, which would involve the creation or enhancement of 68 acres of wetland. The Washington Department of Ecology frequently requires such a replacement ratio. Also, the additional acreages of wetland would also compensate for the loss of hydrologic functioning to the other 108 acres of floodplain wetland. The loss of riparian habitat is very small, only estimated at about 1 acre. However, in order to create properly functioning wetlands the plan will require a 100-foot riparian buffer and the construction of an appropriate inlet to allow high flows into the site from the river, which will more than compensate for the loss of riparian habitat and compensate for the loss of floodplain connections to the 108 acres of wetland.

5.2.2 Original Method

Previously, a habitat evaluation methodology was developed for evaluation of the several potential restoration projects in the basin during the feasibility phase. This method was developed and used with extensive input from an interagency Restoration Working Group. This Original Method was also utilized to evaluate preliminary flood control alternatives and the proposed mitigation plan to ensure that it would provide an appropriate level of mitigation. However, following selection of the preferred flood control alternative, it was determined that the Original Method needed modifications that focused on the types of habitats that would be specifically affected by the flood control project in order to provide a suitable evaluation of the mitigation plan.

5.2.3 Modified Method

The Modified Method retains many of the parameters developed by the Restoration Working Group. However, there are two primary differences in the Modified Method: (1) where the methodology once characterized separate parameters for watershed and localized scales, the current methodology characterizes parameters for the entire project footprint (at a sub-basin scale), and (2) the definitions for parameters have been modified to focus on wetland habitats.

Scores are given to each parameter based on the entire project area. The sub-basin is defined as the mainstem Chehalis and its floodplain from Claquato to Fords Prairie, the lower 2 miles of Skookumchuck River, and Salzer Creek.

Existing condition (without-project) scores for the Modified Method were a direct combination of the existing scores in the Original Method for the mainstem Chehalis, Skookumchuck River, and Salzer Creek for all categories that remained the same or similar. Future without-project conditions assume some continued incremental degradation of habitat quality beyond the existing condition due to continued development, likely piece-meal flood control actions, and continued increase of non-native species; but some are likely to have at least small improvements in water quality due to TMDLs and other actions by state and federal agencies. The wetland habitats are primarily reed canary grass dominated and will continue to be so for the foreseeable future. No known future development is likely to eliminate these wetlands because they are primarily within road right-of-ways, the airport, or other areas unlikely to be subject to development.

Future with-project (with levee) conditions were then scored using the Modified Method definitions. Scoring for future with-project plus mitigation (with levee and mitigation) conditions required additional modification, described in the remainder of this paragraph. The Original Method gave scores to restoration projects based on a template. The template reflected a set of target scores that are likely to be achieved through restoration. That original template is not appropriate to the revised sub-basin scale, since the sub-basin scale is much larger than a localized scale and benefits will be muted at the larger scale. As a result, scores are modified for categories that had previously been assessed at the localized scale to account for the anticipated level of impact/benefit on the sub-basin.

Ultimately, the purpose of the Modified Method is to translate the loss of wetland habitats into a Habitat Unit (HU) output score. Then it is possible to also convert future with-project mitigation actions into a score of wetland HUs gained that can be compared to the expected loss. The table below provides the Modified Method definitions for wetland parameters.

Table 5.2-1: Revised Evaluation Methodology for Wetland Habitats

Parameter	Rating	Definition
Hydrology	5	Peak flows; base flows, and flow timing characteristics differ only slightly from undisturbed conditions throughout most of the watershed. Undeveloped land uses dominate the watershed. Wetlands are inundated or saturated as expected for geomorphic setting.
	4	Watershed hydrograph has moderate changes from undisturbed conditions. Baseflows reduced somewhat by water withdrawals, but floodplain recharge still occurs in many areas of the watershed at flows >2 yr event. Peak flows generally occupy undeveloped floodplain.
	3	Changes in the watershed hydrograph from undisturbed conditions are significant; base flows are reduced due to water withdrawals and reduced groundwater discharge. Floodplain recharge occurs in ~50% of watershed at flows >5-10 yr event.
	2	Pronounced changes in watershed hydrograph. Flooding of structures and low flow problems due to development of floodplain are common in parts of the watershed. Limited floodplain recharge occurs because <50% of floodplain connected below 25-year event. Lack of access to floodplain has increased flooding downstream.
	1	Hydrograph is completely altered. Frequent flooding of developed floodplain areas and low flow problems occur in most of the watershed. Less than 25% of floodplain is connected below a 50-year event. Lack of floodplain has substantially increased flooding in lower watershed.
Sediment	5	Fine sediment deposition/erosion occurs infrequently and is primarily trapped by wetlands and riparian zone. Extent of clean spawning gravels abundant and appropriate to geomorphic setting throughout watershed.
	4	Fine sediment deposition/erosion apparent in less than 20% of watershed. Wetlands and riparian zones trap the majority of fine sediments. Clean spawning gravel present in majority of watershed as appropriate to geomorphic setting.
	3	Coarse sediment sources are moderately inaccessible due to moderate amount of bank armoring and loss of floodplain connectivity. Fine sediment deposition/erosion apparent in ~30% of watershed. Wetlands and riparian zones retain fewer fines due to limited size. Clean spawning gravel is present primarily only in the tributaries.
	2	Coarse sediment sources are infrequently accessible, due to extensive bank armoring and significantly reduced channel migration. Dams or channelization accelerate downstream movement of coarse sediment. Fine sediment deposition/erosion common in ~50% of watershed. Wetlands and riparian areas do not provide sufficient sediment retention due to limited size. Clean spawning gravel infrequent.

Table 5.2-1: Revised Evaluation Methodology for Wetland Habitats

Parameter	Rating	Definition
	1	Coarse sediment sources inaccessible except at >100 yr events. Fine sediment deposition/ erosion common in majority of watershed. Wetlands and riparian areas provide no sediment retention. Clean spawning gravel rare.
Floodplain Interactions	5	Overbank flows occur at a ~2 year flow and occupy a majority of the floodplain. Channel armoring occurs rarely within watershed. Natural floodplain plant communities extensive; wetlands are present as expected for geomorphic setting.
	4	Overbank flows occur at ~5 year flows and occupies a majority of the floodplain. Channel armoring occasional throughout watershed. Natural floodplain plant communities common, particularly along tributaries; disturbance is localized. Wetland habitats present in majority of watershed as appropriate to geomorphic setting; few constraints to channel migration.
	3	Overbank flows occur at >5-10 year flood levels. Channel armoring in approximately a third of the watershed. Natural floodplain plant communities present in less than 50% of watershed; many wetland areas modified for timber harvest, agriculture or development. River is disconnected from ~50% of its former off-channel areas. Channel migration significantly reduced in 30-50% of watershed.
	2	Overbank flows are typically restricted to ~25 year flood levels. Channel armoring or other channelization widely distributed in the watershed. Characteristic floodplain plant communities are infrequent or highly fragmented. Wetlands are highly altered and/or have low functional value.
	1	Overbank flows restricted to ~100 yr flood levels. Channel armoring occurs in most of the watershed. Natural floodplain communities rare or absent. Wetlands are rare or absent.
LWD	5	Abundant LWD of all size classes, but including primarily large-sized pieces, present throughout wetlands, creating habitat diversity and complexity.
	4	Abundant LWD of all size classes present throughout wetlands, creating habitat diversity and complexity.
	3	Moderate amounts of LWD of any size classes present throughout the majority of the wetland.
	2	Low levels of LWD present throughout the majority of the wetland, does not significantly contribute to increased habitat diversity or complexity.
	1	LWD absent or rare.

Table 5.2-1: Revised Evaluation Methodology for Wetland Habitats

Parameter	Rating	Definition
Water Quality	5	Wetland functions are sufficient to remove the majority of sediment, nutrients, heavy metals, and toxic organics from water. Multiple vegetation classes present, including forested, scrub-shrub, and emergent wetland, and wetland is inundated throughout the growing season.
	4	Wetlands functions are sufficient to remove a significant portion of sediment, nutrients, heavy metals, and toxic organics from water. Multiple vegetation classes are present and wetland is inundated during part of the season.
	3	Wetland functions provide removal of some pollutants. More than one vegetation class is present and wetland is inundated during part of the season.
	2	Wetland functions are limited and do not provide significant removal of pollutants from water. One vegetation class is dominant throughout most of the wetland and only inundated during small portions of the season.
	1	Wetlands do not provide sufficient function to remove pollutants. One vegetation class is present and inundation occurs for only brief periods during the growing season or not at all.
Terrestrial Habitat	5	Adjacent floodplain and upland areas provide a diverse mix of habitat types. Habitats are well connected to provide migration corridors and connections between the wetland and upland areas. Disturbance is limited to sparse residential or agricultural/timber harvest.
	4	Adjacent floodplain and upland habitats provide a moderately diverse mix of habitat types with minor fragmentation. Migration corridors are still common between the wetland and upland areas. Watershed has low-moderate level of development or agricultural/timber harvest, which has fragmented some corridors and reduced overall terrestrial habitat.
	3	Adjacent floodplain and upland habitats are moderately disturbed. Migration corridors primarily only intact along the riparian zone with few connections between wetland and uplands. Residential, agricultural/timber harvest, and commercial development are common throughout the watershed and terrestrial habitat is significantly reduced.
	2	Floodplain and upland habitat is highly fragmented. Migration corridors barely intact along wetlands, and are further fragmented as a result of roads and bridges. Development and agricultural/timber harvest, and have significantly reduced available habitat.
	1	Terrestrial habitat and migration corridors limited. Development, agricultural/timber harvest, and roads/bridges cause severe disturbance in majority of watershed.
and Wild life Refu	5	Refugia for fish and wildlife are widely available throughout the project area in the form of wetlands, as appropriate to geomorphic setting. These habitats provide protection from elements and predators and are adequately buffered from human disturbances.

Table 5.2-1: Revised Evaluation Methodology for Wetland Habitats

Parameter	Rating	Definition
	4	Wetland refugia are present in majority of the project area. Existing refugia have adequate buffering.
	3	Wetland refugia exist in less than 50% of the project area and are typically small in size. Existing refugia may have inadequate buffering.
	2	Wetland refugia are uncommon and many are not adequately buffered.
	1	No wetland refugia in project area.
Habitat Complexity/ Connectivity	5	Wetland habitats are highly diverse. Wetlands are inundated throughout the growing season and much of the year. Multiple native vegetation communities and classes are present and well interspersed. Microhabitats are diverse with abundant and varying water depths; cover types, rearing and basking sites. Wetlands throughout the project area are well connected.
	4	Wetland habitats are moderately diverse. Wetlands are inundated throughout majority of growing season. Multiple native vegetation communities and/or classes present and moderately interspersed. Microhabitats include moderately diverse water depths; cover types, rearing and basking sites. Wetlands throughout project area are typically connected, with few roads or bridges.
	3	Wetland habitats are of moderate to low diversity. Inundation occurs through only a portion of the growing season. Native vegetation is dominant, but communities and microhabitats are of low diversity and interspersion. Wetlands have low connectivity with large areas of fragmentation.
	2	Wetland habitats are of low diversity. Two or fewer vegetation classes are dominant and microhabitats have limited diversity. Non-native or invasive species are dominant in many areas. Local habitat is significantly fragmented.
	1	Wetland habitats are not diverse. Vegetation is dominated by non-native species and microhabitats are not diverse. Habitats are not connected and do not provide a migratory link between upstream and downstream habitats.
Species Diversity	5	Localized habitat support multiple native species of fish and wildlife and plants, including rare species. Habitat structure complex and provides suitable habitat for a variety of life history stages. Adjacent habitats are well connected to localized habitat.
	4	Localized habitat support multiple native species of fish and wildlife and plants, although only occasionally for rare species. Provides habitat for a variety of life history stages, although fragmentation of habitats may create slight disconnectedness from adjacent areas.
	3	Localized habitat supports common native species. Exotic species are present but are not dominant in any habitat. Fragmentation has occurred between habitats for different life history stages, and habitats primarily support one or two life history stages.

Table 5.2-1: Revised Evaluation Methodology for Wetland Habitats

Parameter	Rating	Definition
	2	Localized habitat supports common native species. Exotic species are present and are dominant in some areas. Significant fragmentation between life history stage habitats, and habitats primarily support one life history stage. Fish and wildlife populations reduced due to lack of necessary habitats.
	1	Localized habitat supports few native fish; wildlife or plant species and exotic species are frequently dominant. Localized habitat is completely isolated from adjacent habitats. Habitat is poor even for one life history stage. Most fish and wildlife populations not present due to lack of necessary habitats.

5.2.4 Modification of Selected Mitigation Plan

Previously, incremental cost analysis in the draft GRR/EIS indicated that the most cost effective mitigation plan design would include the re-meandering of Scheuber Ditch and creation of wetlands at the north (downstream) end of the ditch. However, upon applying the Modified Method to determine suitability of mitigation, it was found that that plan overcompensated for impacts of the selected flood damage reduction alternative. It was also found that the re-meandering of the nearly 10,000 foot long Scheuber Ditch and associated riparian revegetation provided significant habitat benefits but with significant cost and not necessarily in-kind mitigation value. As a result, alternative mitigation designs in the vicinity of Scheuber Ditch and SR-6 were evaluated to determine which configuration would provide the appropriate level of mitigation, without incurring unnecessary expenses from out-of-kind mitigation measures.

Although mitigation requirements for the project are primarily for wetlands, there will be significant impacts to floodplains as a result of levee construction. Approximately 108 acres of 2-year floodplain wetlands will be disconnected by levees, which will incrementally reduce groundwater recharge and sediment and pollutant retention in the sub-basin. The loss of floodplain connectivity is not quantifiable, but the design of the mitigation plan should include floodplain connections wherever feasible. Creation of wetlands at the south (upstream) end of the floodplain, with a connection to the Chehalis River beneath SR-6 can provide increased floodplain interactions. There would then be more frequent flood connections to the undeveloped floodplain along Scheuber Ditch. This revised plan would provide in-kind mitigation (wetlands and floodplain interactions) without providing the out-of-kind mitigation included in the previous plan. The significant loss of floodplain in the area has resulted in a great need for increased groundwater recharge in the basin to maintain base flows in the river. The configuration of the selected Oxbow/SR-6 mitigation plan will allow greater floodplain connectivity with the Chehalis River and increased groundwater recharge on a frequent basis.

The proposed wetland mitigation will create or enhance 68 acres of wetland immediately north of SR-6 in the undeveloped floodplain. This will require the excavation of a new channel between the Chehalis River and the oxbow immediately south of SR-6. The channel will continue westward across the undeveloped floodplain and will connect to a tributary that passes beneath South Scheuber Road. The tributary will be diverted into the new channel to provide another source of hydrology for the wetlands and channel and be designed to have positive

drainage back to the Chehalis River to prevent fish stranding. Wetlands will be connected to the newly excavated channel and will also have positive drainage back to the Chehalis River to prevent fish stranding. The channel and wetlands will be designed to have a frequent surface water connection with the Chehalis River during winter flows. A berm will be constructed between the new channel and Scheuber Ditch to prevent flows below the 2-year flood elevation from connecting to the ditch (to prevent fish stranding and also prevent fish from entering the very poor quality habitat in Scheuber Ditch except during flood flows when the entire floodplain is connected. A portion of SR-6 will be replaced with a bridge to accommodate the new channel and allow the floodplain interactions. A 100-foot riparian buffer will be planted along the new channels and around wetlands to ensure proper functioning of the wetlands. Large woody debris (LWD) will be placed to enhance fish and wildlife habitat. A plan view of the Oxbow/SR-6 mitigation is attached to this report.

5.2.5 Final Mitigation Plan and Habitat Outputs

Scoring for each wetland parameter at a sub-basin scale for the selected mitigation plan is shown in Table 5.2.5. The total score for each condition is summed and divided by the total possible score to find the index score, which is a number between 0 and 1. The index score is then multiplied by the acres of wetland to find the habitat unit (HU) output score.

The total wetland HUs lost with the construction of the levee is 102.1. The implementation of the selected mitigation plan provides a recovery of 115.4 HUs of wetland, which adequately compensates for the original wetland loss. This surplus will adequately address the direct loss of 34 acres of wetlands plus the degradation of 108 acres of floodplain wetland, as well as providing a buffer against any risk and uncertainty associated with creation of wetlands.

Table 5.2-2: Habitat Quality Scores for the Modified Method

Wetland Parameters	Existing Conditions (2003)	Future Without-Project Conditions (2053)	Un-impacted lands with Project	Mitigation Value of impacted acres with Project
Hydrology	2	1.9	1.9	1.7
Sediment	2	1.9	1.9	1.6
Floodplain Interactions	1.7	1.6	1.6	1.7
LWD	1	1	1	1.3

Water Quality	1.5	1.7	1.7	1.7
Terrestrial Habitat	1.5	1.4	1.4	1.8
Fish and Wildlife Refugia	1.2	1.1	1.1	1.8
Habitat Complexity/Connectivity	2	1.9	1.9	2.5
Species Diversity	1.2	1.2	1.2	1.5
Total Score	14.1	13.8	13.8	15.6
Total Possible Score	45	45	45	45
Index Score	0.31	0.30	0.30	0.35
Acres of Wetland in 2-year Floodplain	1342	1342	1308	68
Habitat Units (HUs)	416.02	402.6	392.4	23.8
			416.2	
HABITAT UNITS GAINED WITH MITIGATION = 115.4				
NET EFFECT = 13.3 HABITAT UNITS GAINED				

Wetland acreages were calculated using National Wetland Inventory (NWI 2001) mapping. The NWI mapping does not include many emergent wetlands, but is suitable for comparing affected wetland habitats as a result of flood control actions. All wetlands within the 2-year floodplain, as delineated by Corps mapping, were summed to get the total wetland area for existing conditions. Total mapped wetland area within the project sub-basin was 1,342 acres. For the purposes of estimating future without-project conditions the wetland acreage remained the same as now, because no projects that might eliminate these wetlands are known. For the with-project condition, an estimated total of 34 acres of wetland will be eliminated as a result of levee construction. Thus, the total wetland acreage in the 2-year floodplain will decrease from 1342 to 1308 acres. Approximately 108 acres of wetlands mapped within the 2-year floodplain will also be disconnected from the river by levees. These wetlands will be further fragmented with levee construction and will have a change in hydrology and thus the quality scores go down.

5.3 MITIGATION DESIGN

5.3.1 Chehalis River Stage Data

In order to ensure a frequent surface water connection between the mainstem Chehalis and mitigation wetlands during winter flows, it was necessary to obtain data regarding the average

surface water elevation of the Chehalis River between November and March. Chehalis River stage data were downloaded from the USGS website. This stage data indicates the water surface elevations (WSEL) for the river during the winter months. However, the stage recorder data utilized comes from a gage station located near the wastewater treatment plant (WWTP) in Chehalis, Washington. The project location is located approximately 3 river miles upstream. Comparison of the WSEL, surveyed by the Corps of Engineers in August 1999, shows a drop of about four vertical feet between the project site and the gage location. The following table summarizes the measured and estimated water surface elevation data. Three years of data were available for this particular site (2000-2003), which is located downstream of the project site.

Table 5.3-1: WSEL Data for the WWTP Gage Location and the Project Site

	Gage		Project Site	
	(Chehalis River at WWTP)		(estimated as WWTP+4')	
	All Data (2000 - 2003)	Winter (Nov-Mar)	All Data (2000 - 2003)	Winter (Nov-Mar)
Average	152.9	154.8	156.9	158.8
Maximum	175.9	175.9	179.9	179.9
Minimum	147.2	147.2	151.2	151.2
90% Exceedence	148.6	149.1	152.6	153.1
10% Exceedence	160.0	162.8	164.0	166.8
2-year (approx.)	172.0		176.0	
Design Invert at Connection			151.0	

These values are rough approximations only. A thorough analysis of the floodplain model results would better predict water surface elevations adjacent to the project site for varying flow conditions and will be necessary for detailed design. Additional gage data from other sites with longer records should be analyzed before proceeding with more detailed project designs.

5.3.2 Depth of Channel Excavation

The lowest WSEL (at WWTP) between November and March is 147.2 feet. This stage reading was recorded on November 1, 2002, so it represents the lowest winter flow for the period of record as well. The corresponding WSEL adjacent to the project site would be approximately 151.2 feet. A design invert for the Chehalis River connection was selected as 151 feet to provide frequent flow during the winter months (November to March). This is an initial approximation only; further detailed hydrologic analysis may yield a different design invert. A higher invert could result in cost savings to the project, but might be connected less frequently at shallower

depths. Conversely, a lower invert might also be selected to provide additional connections during the low-flow periods. The existing ground elevations along the proposed channel alignment generally range between 165 and 180 feet, giving excavation depths between 15 and 30 feet.

5.3.3 Area of Riparian and Wetland Habitats

The total riparian area at the site will be 20 acres. The total wetland area will be 68 acres. It is assumed that 60 percent of the wetland area, or 41 acres, will be scrub-shrub wetland, while the remaining 27 acres will be emergent wetland. The estimated total habitat output of the site is estimated at 115.4 HUs (102.1 HUs plus 13% R&E factor). Specifications for species to be planted are shown in Table 5 below. Although this is different in size and appearance than the area depicted in figure 2.6 this figure has the more accurate size for mitigation. The larger area depicted in figure 2.6 has potential to be utilized in possible restoration projects in the future.

5.3.4 Depth of Wetland Excavation

Existing ground elevations vary between 165 and 168 feet in the area of wetland excavation. The excavation requirements and wetland design is based on the assumption that it would be necessary to excavate a minimum of 24 inches to get to hydric soils or groundwater from the 165 foot elevation. This assumption is based on best professional judgment and would need to be verified through soil tests and piezometer installation before proceeding with more detailed designs. Approximately 30 percent of the wetland footprint falls between elevations of 165 and 166 feet. That means that 30 percent of 68 acres, or 20 acres, needs to be excavated down by 2 feet. Approximately 60 percent of the wetland footprint falls between elevations of 166 and 167 feet, resulting in a total of 41 acres that would have to be excavated down by 3 feet. The remaining 10 percent of wetlands falls between elevations of 167 and 168 feet. This results in 7 acres that would have to be excavated down by 5 feet. Excavation rates at each elevation would vary to provide microtopography and increase diversity of aquatic habitats. However, the uniform rates of excavation in this paragraph provide an estimate of excavation requirements for the cost estimate.

5.3.5 Height of Berm

According to the draft GRR/EIS, the reach *Chehalis 2* has a 2-year flood event that reaches WSEL 172 feet. A WSEL adjustment of +4 feet for the project area (there is no significant

difference between the *Chehalis* 2 Reach and gage at WWTP) gives a 2-year flood event WSEL at the project site of 176 feet. The berm between the tributary and Scheuber Ditch will have to be built up to at least 176 feet to prevent a connection between the two at flows less than the 2-year event. These values should be verified against the result of the floodplain modeling efforts before proceeding with more detailed designs. Flows at or above the 2-year event will be assumed to connect to Scheuber Ditch and flow out to the Chehalis through the ditch and floodplain. An overflow spillway would need to be constructed to prevent the berm from washing out during flood flows. The length of the berm spans the existing ground elevation to the 176 feet level.

5.4 COST ESTIMATE

5.4.1 Description of Costs and Preliminary Construction Sequence

Mobilization costs of \$50,000 are assumed, amounting to approximately 1 percent of total construction costs. This could be higher, depending on the type of equipment used. Mobilization costs for dredge equipment varies significantly, depending on the size and capacity of the dredge. Due to the uncertainty in the construction methods and design inverts, a relatively high contingency of 35 percent has been assumed. Additional costs, such as higher mobilization costs for large dredge equipment, are within contingency estimate.

The project would most likely begin with the construction of a temporary roadway around the excavation area for the bridge. Once the roadway is constructed, demolition of the existing roadway at the crossing would be followed by approximately 10,000 CY of excavation to shape the new channel banks beneath the bridge. A dewatering cost of \$10,000 is assumed for this area.

This number could be higher, depending on the soils and groundwater characteristics. The excavated material could be used to construct the new berm, which would need to follow guidelines for levee construction. The soil's suitability for use as fill material would need to be tested. Testing results will also show the appropriate side slopes for the berm, which are currently assumed at 3:1. A rip rap overflow spillway could be located near the Scheuber Ditch crossing to allow flood flows to pass through Scheuber Ditch back to the Chehalis River downstream. The costs of the riprap for the overflow weir are assumed to be wrapped up in the unit costs for placing and compacting the fill material for the berm.

Traffic control during connection and disconnection of the temporary roadway is assumed to amount to be approximately \$10,000. This could vary depending on the duration of road closure. The presence of utilities in the area is unknown, but these would need to be disconnected or realigned prior to commencement of excavation. A placeholder of \$10,000 is used until further information becomes available.

After excavation, abutments and pier foundations would need to be constructed. A cost of \$20,000 per bridge abutment is assumed at this level. Soil test results will determine the need for piling to support the abutments and piers, which could raise the costs significantly. A 150-foot span is considered for the crossing. A center pier would not be advisable, so the design could use three 50-foot spans with two sets of piers. The bridge girders and deck slabs are assumed to be precast units delivered to the site. A 150-foot span would require approximately 2:1 side slopes beneath the bridge, which is different than the 3:1 slope used elsewhere in the excavated channel. Bank stabilization techniques may be required to sustain a 2:1 side slope, depending on soil test results. The bridge span could be shortened if soil conditions or bank stabilization allow for steeper side slopes.

A deck width of 32 feet is assumed, which allows for two lanes of traffic with narrow shoulders. The existing roadway in the surrounding area is approximately 45 feet wide. Wider shoulders across the bridge would increase the costs proportionally. The bridge deck is assumed to cost \$100 per square foot. Depending on the use of piers and the selected bridge type, this number could be higher. Once the bridge is in place, traffic could be rerouted over the bridge. The remaining excavation in all areas not affected by the rerouted traffic could take place concurrently with bridge construction.

It is anticipated that the channel excavation would begin near the Chehalis River connection using a dredge operation. The suitability of dredge operation will depend on a number of factors including the availability of flow, the disposal area used (considering the distance and elevation difference), and water return requirements, specifically if water needs to be returned to the river to maintain flows. Conditions are assumed to be conducive to dredging operations although they have not been investigated at this level. If land-based equipment is used, dewatering costs could increase the overall excavation costs. Haul distances and suitability for use of the soil as fill material elsewhere is unknown at this point, but could affect the unit costs of transporting the material significantly. The potential to utilize excavated material in construction of the levees should be investigated.

The alignment of the channel excavation is shown through the upstream end of the existing oxbow, which would follow the most natural flow pattern. If, instead, the downstream end of the oxbow were to be used, it would result in a shorter path to the road crossing (about 1,000 lineal feet shorter). This might result in cost savings for excavation but flood flows would not follow the historical flow path, which could have some disadvantages as far as sedimentation, erosion, or other unanticipated results. The advantages and disadvantages of the selected alignment, or other alternative alignments, should be examined in more detail during the PED phase.

The wetland excavation area appears to be largely devoid of trees and large shrubs thus, clearing and grubbing are not listed as separate line items. The unit costs for excavation and planting are assumed to include minor clearing and grubbing, in addition to stripping, stockpiling, and replacing the topsoil. LWD would be placed in the channel and wetland areas at four per acre, with an additional 50 pieces in the channel area. The LWD would be approximately 20 feet long with root balls intact. A unit cost of \$750 is assumed, which accounts for burying and stabilizing LWD. The costs could be higher if complex anchoring techniques are employed.

In addition to the 35 percent contingency, a construction administration and inspection fee of 12 percent of construction costs is added to the total construction costs. A summary of the PED and Construction cost estimates is provided in Table 4. The MCACES cost estimate is provided as an appendix to this FEIS. Note that the total initial project cost reported in Table 4 is slightly different from the total project cost determined through MCACES. This is a result of specific tax rates utilized by MCACES. The total project cost according to MCACES is \$9,784,000. The construction period for the mitigation plan is estimated to span 180 days.

Costs for operation and maintenance (O&M) of the mitigation plan are shown on the cost estimate summary below. Essentially, costs are associated with maintaining the mitigation project after it is built or repairing the project after a flood event or other natural disaster. It is estimated that some amount of vegetation will have to be replaced during the establishment period (annually for the first 5 years). Sediment that settles into the wetlands or channel, compromising the habitat quality, will need to be excavated periodically. Areas that erode significantly may require repair. A one-time project cost of \$10,000 is assumed for repairs needed following a large event, such as the 100-year flood. Costs for maintaining the SR-6 Bridge are estimated to be 1 percent of the total bridge construction cost. This translates into an annual cost of \$5,800 for the life of the project. A summary of the O&M cost estimates is provided in Table 4. Expected average annual O&M costs for the mitigation plan are estimated to be approximately \$20,000 per year.

COST ESTIMATE SUMMARY

Table 5.4-1: Oxbow/SR-6 Mitigation Plan Cost Estimate Summary

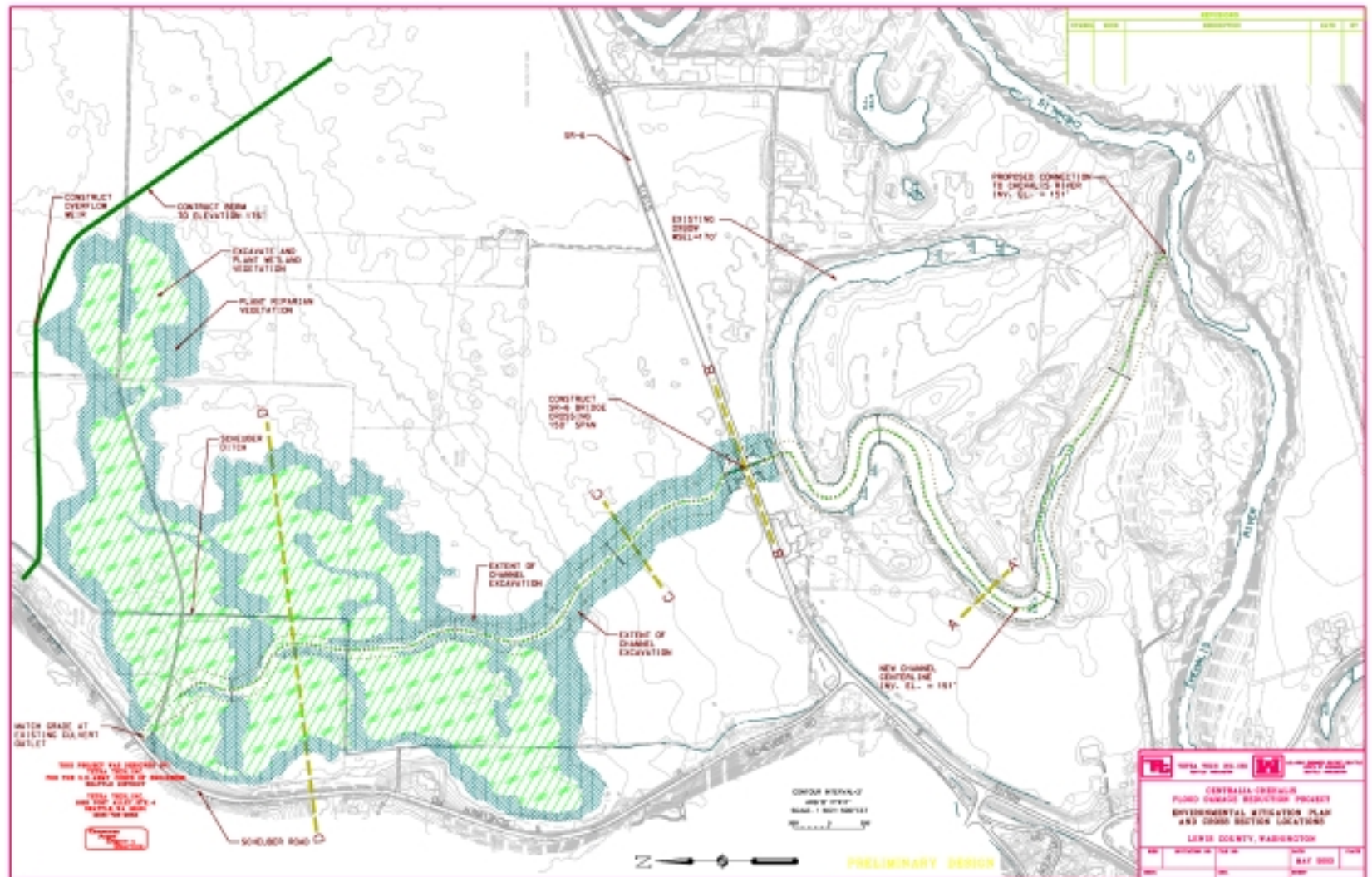
Task	Quantity	Unit	Unit Cost	Total Cost	Notes
Mob/Demob	1	ls	\$ 50,000	\$ 50,000	~1% of construction subtotal
Dewater	1	ls	\$ 10,000	\$ 10,000	Culvert area only, assume oxbow dredged
Excavate/Haul Oxbow	215,000	cy	\$ 7	\$ 1,563,050	10' bottom 3:1 SS = 1250 sf section * 4650 lf; dredge transport 1-2 miles
Traffic Control	1	ls	\$ 25,000	\$ 25,000	Signage/flagging, temporary road construction around bridge excavation area (incl. demo)
Relocate Utilities	1	ls	\$ 10,000	\$ 10,000	Assume buried cable, telephone, power
Demo Ex Roadway	1,250	sf	\$ 4	\$ 5,513	45' x 250' asphalt
Excavate/Haul Bridge Mat'l to Prop. Grade	10,000	cy	\$ 4	\$ 40,000	150' x 150' x 30' with 2:1 SS
Foundation Work for Bridge Abutments	2	ea	\$ 20,000	\$ 40,000	Drive piles and cast abutments in place
Reinforce Side Slopes beneath Bridge	7,500	sf	\$ 3	\$ 22,500	Protect 2:1 Side Slopes with Geomat or similar
Install Precast Bridge Girders	4,800	sf	\$ 100	\$ 480,000	Fabricate, deliver, and install 32' x 150' girders, cast deck in place
Construct Approach Slabs	1	ea	\$ 15,958	\$ 15,958	Construct approach slabs, repave transitions
Excavate/Haul Channel Mat'l	220,000	cy	\$ 6	\$ 1,251,800	10' bottom, 3:1SS, Avg xs 1600 sf, 3700 ft length; haul 5 miles
Excavate/Haul Rip/Wetland Mat'l	303,000	cy	\$ 6	\$ 1,724,070	Avg 3' depth, 68 acres; haul 5 miles
Exc\Place Fill for Scheuber Ditch Berm	7,000	cy	\$ 4	\$ 28,000	Reuse cut mat'l onsite, fill berm to 176' (2-yr flood), 3600x 5' avg ht, 2:1 SS
Plant Riparian Vegetation	20	ac	\$ 7,560	\$ 151,200	Riparian footprint measured from CAD
Plant Emergent Wetland Vegetation	27	ac	\$ 4,255	\$ 114,885	Wetland footprint measured from CAD, 40% emergent
Plant Scrub-shrub Wetland Vegetation	41	ac	\$ 3,300	\$ 135,300	Wetland footprint measured from CAD, 60% scrub-shrub
Place LWD	322	ea	\$ 700	\$ 225,400	Place and bury 4 pieces per acre of riparian/wetland area + 50 for channel
Construction Subtotal				\$ 5,892,676	
Contingency	35%			\$ 2,062,436	
Subtotal				\$ 7,955,112	
Construction Admin & Bond and profit Inspection	22.95%			\$ 1,825,698	Same percents as used in USACE Flood Control MCACES Estimates
Total Initial Cost				\$ 9,780,810	
Operation and Maintenance Requirements				\$ 2,000	Replace vegetation annually during establishment period (5 years)
				\$ 10,000	1-time cost during project life for major flood damage
				\$ 2,000	Annual cost during project life for excavation of settled sediment and bank repair
	1% of bridge costs			\$ 5,800	Annual cost during project life for maintaining bridge

Table 5.4-2: Recommended Plantings for Wetlands and Riparian Areas and Associated Costs

Species	Common Name	Size	Quantity per Acre	Cost Each Installed	Cost Total per Acre
Scrub-shrub Wetland					
<i>Spirea douglasii</i>	Douglas' spirea	1 gal	200	\$4.00	\$800.00
<i>Salix lucida</i>	Pacific willow	cuttings	250	\$1.00	\$250.00
<i>Salix scouleriana</i>	Scouler's willow	cuttings	250	\$1.00	\$250.00
<i>Rubus spectabilis</i>	Salmonberry	1 gal	200	\$4.00	\$800.00
<i>Acer circinatum</i>	Vine maple	1 gal	200	\$4.00	\$800.00
<i>Malus fusca</i>	Western crabapple	1 gal	100	\$4.00	\$400.00
					\$3,300.00
Emergent Wetland					
<i>Salix geyeriana</i>	Geyer willow	cuttings	200	\$1.00	\$200.00
<i>Salix sessifolia</i>	Soft-leaved willow	cuttings	200	\$1.00	\$200.00
<i>Sagittaria latifolia</i>	Wapato	tuber	100	\$0.75	\$75.00
<i>Juncus oxymeris</i>	Pointed rush	rhizome	1200	\$0.50	\$600.00
<i>Juncus patens</i>	Grooved rush	rhizome	1200	\$0.50	\$600.00
<i>Carex densa</i>	Dense sedge	bareroot	1200	\$0.50	\$600.00
<i>Carex lenticularis</i>	Lenticular sedge	seeds	2	\$30.00	\$60.00
<i>Carex stipata</i>	Sawbeak sedge	bareroot	1200	\$0.50	\$600.00
<i>Eleocharis palustris</i>	Creeping spikerush	rhizome	1200	\$0.50	\$600.00
<i>Beckmannia syzigachne</i>	American sloughgrass	plug	1200	\$0.50	\$600.00
					\$4,255.00
Upland Riparian					
<i>Populus balsamifera</i>	Black cottonwood	1 gal	80	\$4.00	\$320.00
<i>Fraxinus latifolia</i>	Oregon ash	1 gal	80	\$4.00	\$320.00
<i>Alnus rubra</i>	Red alder	1 gal	50	\$4.00	\$200.00
<i>Thuja plicata</i>	Western red cedar	2 gal	80	\$6.00	\$480.00
<i>Abies grandis</i>	Grand fir	5 gal	50	\$15.00	\$750.00
<i>Pseudotsuga menziesii</i>	Douglas fir	2 gal	80	\$6.00	\$480.00
<i>Acer macrophyllum</i>	Big-leaf maple	2 gal	80	\$6.00	\$480.00
<i>Tsuga heterophylla</i>	Western hemlock	2 gal	60	\$6.00	\$360.00
<i>Amelanchier alnifolia</i>	Serviceberry	2 gal	50	\$6.00	\$300.00
<i>Cornus nuttallii</i>	Pacific dogwood	2 gal	30	\$4.00	\$120.00
<i>Cornus sericea</i>	Red osier dogwood	1 gal	200	\$4.00	\$800.00
<i>Salix lucida</i>	Pacific willow	cuttings	200	\$1.00	\$200.00
<i>Salix scouleriana</i>	Scouler's willow	cuttings	200	\$1.00	\$200.00

Table 5.4-2: Recommended Plantings for Wetlands and Riparian Areas and Associated Costs

Species	Common Name	Size	Quantity per Acre	Cost Each Installed	Cost Total per Acre
<i>Lonicera involucrata</i>	Twinberry	1 gal	200	\$4.00	\$800.00
<i>Physocarpus capitatus</i>	Nine-bark	1 gal	75	\$4.00	\$300.00
<i>Sambucus cerulea</i>	Blue elderberry	2 gal	50	\$7.00	\$350.00
<i>Rosa pisocarpa</i>	Swamp rose	1 gal	200	\$4.00	\$800.00
<i>Crataegus douglasii</i>	Douglas hawthorn	1 gal	75	\$4.00	\$300.00
					\$7,560.00





6. CUMULATIVE IMPACTS

6.1 INTRODUCTION

The combined, incremental effects of human activity, referred to as cumulative impacts, pose a serious threat to the environment. While they may be insignificant by themselves, cumulative impacts accumulate over time, from one or more sources, and can result in the degradation of important resources. Because federal projects cause or are affected by cumulative impacts, this type of impact must be assessed in documents prepared under NEPA.

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time. Thus the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the actions.

Cumulative impact analyses typically review historic impact, current conditions and reasonably foreseeable future impacts. In the following sections, historic, current, and reasonably foreseeable conditions are summarized for the study area and then examined in relationship to the preferred alternative and its potential to result in cumulative impacts to each subject area (biological resources, cultural resources, etc.)

6.1.1 Historic Impacts to the Study Area

The study area experienced various forms of development since the mid-19th century. Development activities included extensive logging, diking, road and highway construction, navigational improvements, damming, grazing, agriculture, and residential and commercial development.

The most dramatic changes to the Chehalis River occurred during aggressive efforts by the federal government to improve the navigability of the river in the late 1800s and early 1900s (for example, see Secretary of War 1890). This included the removal of snags, overhanging trees, logjams, drift heaps, shoals, and other obstructions to navigability. In one year (1887), 293 large snags were removed from the main channel, beginning at Claquato and ending near Oakville (approximately 16 miles), and masses of log drifts and logjams were loosened or burned (Secretary of War 1887). The practice of removing woody obstructions continued for decades through this reach for purposes of floating logs generated by timber operations (Secretary of War 1892, Wendler and Deschamps 1955).

Logging development also made dramatic changes to the study area. The earliest logging dams were built in the 1880s and continued through the 1920s. Splash dams were built on Elk Creek, Hope Creek, Chehalis River, South Fork Chehalis, Deep Creek, and the Skookumchuck River. The length of time that the dams remained in the streams ranged from less than 1 to more than 50 years, with an average of about 20 years. All splash dams were removed, washed out, or burned prior to 1944 except for one splash dam that may remain intact on Elk Creek (as of 1955) (Wendler and Deschamps 1955).

Splash dams were intentionally destroyed to carry logs downstream, a process termed “splashing.” This process significantly affected channel dynamics. The floods of logs and water scoured or moved the gravel bars, leaving only barren bedrock or heavy boulders (Wendler and Deschamps 1955). New channels were created in some areas and/or the geometry (width, depth, cross-section shape) of existing channels was changed. Splashing occurred on the average of once each week, but in some cases once a day. If the sudden influx of logs into a stream below the dam caused a logjam, dynamite or black powder was used to clear the obstruction (Wendler and Deschamps 1955). Natural logjams were removed in the process as well. The lack of logjams and the scour from splash dams has resulted in a simplified stream system in which water and sediment is routed much faster than prior to basin settlement.

Logging and agricultural development resulted in clearing of vast areas of native vegetation, including wetlands and riparian areas as well as upland forests. Much of the historic wetland area in the Chehalis Valley had drainage tiles or ditches or both constructed to facilitate agricultural use. Many of the riparian areas were either logged or cleared to open more area for agricultural or residential and commercial development.

Most of the residential and commercial development has occurred around the cities of Centralia and Chehalis. These two cities occupy portions of the floodplain, while their associated infrastructure crosses the river, its tributaries, and their floodplains.

As the population of the area increased over time, the surrounding floodplain experienced a relative increase in the amount of development pressure. Residential and agricultural developments occurred within flood-prone areas to accommodate the increased population. These newly developed areas required transportation corridors and other infrastructure, as well as commercial businesses to support them. As a result, damage to buildings and infrastructure from flooding increased as development of the floodplain proceeded.

The road system in the study area developed in response to population increases and the establishment of farms, residential areas, industries, and commercial businesses in the mid to late 1800s. Land uses and the transportation system built to serve these uses were influenced by the opportunities and constraints presented by natural land features, including steep slopes, rivers and streams, and floodways. Rail lines were constructed to transport the agricultural commodities, timber, and lumber produced in the area, and subsequent patterns of industrial and commercial growth were largely determined by the locations of the rail lines and depots. I-5 was later constructed along the general corridor established by the rail lines. The construction of I-5 included the relocation of the lower portion of the Skookumchuck River.

Flooding of roadways and rail lines was historically a problem in large portions of the study area; for example, photographs of downtown Centralia taken in the early 1900s show vehicles axle-deep in floodwaters. Flood damages in the area increased as more development occurred in the floodplain.

The changes brought about by navigation work, logging, agriculture and residential and commercial development had a significant impact on the biological resources of the study area. The major impacts included:

Loss of wildlife habitat. Clearing of native vegetation and the construction of major transportation corridors virtually eliminated large mammal populations from the area. Remaining wildlife habitat is scattered in a scattered areas around the floodplain and no longer provides pathways for animal migration.

Loss of fishery habitat. The Chehalis River once supported a complex aquatic community, including anadromous and resident fish species. Back channels, braided channels, shallow gravel beds, and pool and riffle complexes allowed for highly productive habitats. Navigation work and land use practices resulted in altered hydrology and sediment transport into streams and rivers and a reduction in biodiversity to the detriment of fish spawning and rearing habitat. The clearing of wood jams and snags from the Chehalis River (including the tributaries) changed the fish habitat creation and nutrient retention patterns within the floodplain. The influence of woody debris jams on the creation of off-channel and other rearing habitat had been similarly reduced.

Loss of wetlands and riparian areas. Clearing of wood jams and snags from the Chehalis River system (including the tributaries) also changed the flooding and ponding patterns within the floodplain, which reduced the extent of wetlands and riparian areas. Wetlands were also drained throughout the study for agriculture and filled for development. Riparian areas were logged and cleared for both agricultural and development purposes. This resulted in losses of fish and wildlife habitat, decreases in water quality, loss of floodwater retention and detention, and loss of low flow augmentation to the Chehalis River and its tributaries.

Loss of native vegetation. Grazing and clearing of the native prairies (as well as clearing in other habitat types) resulted in a loss of biodiversity and habitat.

Loss of migration corridors for plant and animal species. Construction of major features such as I-5 and development of the floodplain resulted in the fragmentation and isolation of habitat. This essentially created islands of habitat and plant populations. The result of this is the outright loss of plant and animal species or much smaller populations of both. This has reduced both the biodiversity and the ecological health of the entire basin ecosystem.

The principle pathways of the impacts identified above are: (1) modification of the waterways; (2) modification of the floodplain; (3) agricultural and silvicultural practices; and (4) the development of urban centers and major transportation corridors.

6.1.2 Current Condition in the Study Area

Current conditions in the study area are largely a result of the historic changes to the Chehalis River system. Although the majority of the Chehalis River floodplain remains in agricultural use, the severity of floods in the area appears to be increasing, and flood damages have risen significantly. As recorded at the Grand Mound gage, the February 1996 and January 1990 floods

represent the first and second highest floods, respectively, observed in the Chehalis Basin since 1929. Six other major floods occurred in the past decade. These include the third and sixth highest floods of record, which occurred in November 1986 and November 1990, respectively. Because the Skookumchuck confluence was relocated to its present location, the additional water raises the water surface within the Chehalis River downstream of the confluence and creates a backwater effect upstream of the confluence.

The floodplain currently shows numerous oxbows and other features formed by cutoff of meander bends. Aerial photographic analysis indicates that these features formed sometime before 1949 (earliest available aerial photographs of the study area) and have changed little in the past 50 years. These features are not ancient, and are likely no more than a few hundred years old. Given the extremely low gradient of the channel and floodplain through the study area, the oxbows present on the floodplain can be interpreted as features that were formed during a period when large woody debris (LWD) was abundant within the Chehalis River. LWD probably caused the formation of side channels and oxbows. This is supported by the observation that no new oxbows or channel features have formed in the past 50 years even though the basin experienced several large flood events.

The study area still plays an important ecological role because it continues to support remnant forest, prairie, riparian and wetland ecosystems as well as providing support for fisheries and wildlife. Current practices of development and land use include modification of the floodplain through development and ongoing agricultural and silvicultural practices. These would likely continue to diminish beneficial functions associated with the remnant ecosystems.

Current land uses in the study area are composed primarily of residential, agricultural, and silvicultural uses, although commercial and light industrial uses have been increasing in recent years. Commercial development has been focused primarily along the I-5 corridor in Centralia and Chehalis. Improvements to transportation corridors in the area are ongoing. The area is expected to continue to undergo development in accordance with locally adopted comprehensive plans.

Portions of I-5 are subject to inundation during large flood events, which has resulted in the multi-day closure of the freeway between Chehalis and Centralia. Primary arterials, including all north-south roads between Chehalis and Centralia, are also inundated with floodwaters during larger floods. Flooding has accelerated the deterioration of the substructure of some arterial routes in the area, causing damage to the roadway sub-base and pavement (City of Chehalis

1999). Larger floods also cause portions of the rail lines to become temporarily unusable when the subgrade becomes saturated or the rail lines are overtopped by floodwaters.

6.2 REASONABLY FORESEEABLE IMPACTS TO THE STUDY AREA

Residential, commercial, and industrial development within flood-protected areas would continue, primarily within designated urban growth boundaries in and around Chehalis and Centralia. This development would increase the extent of impervious surfaces, resulting in additional runoff and decreasing groundwater recharge in these areas. Management of stormwater runoff from developed areas would be subject to local and state guidelines and requirements. The effects of a decrease in groundwater recharge from these areas are expected to be minor, as they represent a relatively small portion of the overall basin, and are generally located on fine-grained soils with low infiltration rates.

The Washington State Department of Transportation (WSDOT) is currently evaluating traffic improvements to I-5, which may include widening of the freeway and the reconstruction of existing freeway exit and entering ramps. There is no timetable for these actions but they are likely to be proposed within the next 5 to 10 years. These improvements would potentially impact the land use adjacent to the freeway and the interchange areas. Lewis County is also sponsoring a proposal for new interchanges and connections to the local road system in the vicinity of the existing LaBree Road overcrossing and in north Lewis County. The local jurisdictions would continue to develop maintenance, safety and capacity improvements, and street extensions as part of their comprehensive and capital improvement planning activities.

Relocation of the municipal sewage treatment plant is foreseeable in the next 5 years and changes in operation at the PacifiCorp Steam plant may alter needs for Skookumchuck River withdrawals.

The Corps of Engineers in partnership with Grays Harbor County has begun study of the entire Chehalis Basin (Chehalis Basin Ecosystem Restoration Project). The purpose of this study is to select a myriad of project alternatives, which both recover the degraded ecosystem, primarily for salmonid recovery, and provide ancillary flood damage reduction benefits to the basin. This is in addition to and inclusive of watershed management planning and analysis currently underway by state and local agencies within the basin.

The study includes intensive public and agency involvement with the purpose of selecting projects that will benefit the goals of ecosystem restoration with ancillary flood damage reduction. The current understanding is that the selected projects would be implemented over a 10 to 15 year period.

6.2.1 Cumulative Impacts Associated with the Preferred Alternative

6.2.1.1 Hydrology and Hydraulics

The preferred alternative would result in little change to flooding within the active portions of the Chehalis River floodplain and its tributaries. Significant changes to the extent of flooding in the Chehalis River valley would occur only during large floods. Areas that would be prevented from flooding are generally not within the active floodway, but instead are backwater or temporary storage areas where short-duration flooding occurs. Modifications to the Skookumchuck Dam and reservoir operations would eliminate large overtopping floods on the Skookumchuck River and replace them with smaller events of greater frequency and duration.

Substantial increases in flood stage or flow velocities within and upstream or downstream from the study area are not expected. The preferred alternative would have no significant effect on recharge of groundwater resources. The long-term changes associated with development of the basin would continue to dominate the hydrology and hydraulics of the Chehalis River system, and would be little affected by project implementation. Mitigation actions associated with the preferred alternative would reconnect portions of the Chehalis River to the adjacent floodplain. These actions would be expected to enhance local groundwater recharge associated with minor (1- to 2-year) floods.

The preferred alternative would alter flood stages and timing of flows in the study area and potentially could contribute to the cumulative effects of past hydrologic and hydraulic modifications. Future development in areas that would be protected from flooding would result in changes in runoff and infiltration. However, design considerations incorporated into the preferred alternative would avoid unnecessary impacts, minimize unavoidable impacts, and provide mitigation to offset potential impacts and restore some historic functions of the Chehalis river floodplain. No specific information is available on likely future development, including improvements to I-5, however, these projects would also be rigorously analyzed for impact

avoidance and minimization. No significant cumulative impacts to hydrology and hydraulics are expected.

6.2.1.2 River Geomorphology

The anticipated effects on river geomorphology in response to predicted changes in hydrology and hydraulics are negligible. The long-term channel changes associated with the historical removal of LWD and the relocation of the Skookumchuck River confluence would likely continue unaffected by the preferred alternative. While there is currently a very limited source of LWD along the Chehalis River within the study area, the preferred alternative allows for the future establishment of a restored riparian zone that could supply LWD to the channel through bank erosion and channel migration in the future. No specific information is available on likely future development, including improvements to I-5, however, these projects would also be rigorously analyzed for impact avoidance and minimization. No significant cumulative impacts to river geomorphology are expected.

6.2.1.3 Cumulative Impacts on Water Quality

Construction of the project in the Chehalis River watershed have the potential to cause temporary and intermittent increases in suspended solids or concentrations of biostimulatory nutrients (nitrogen and phosphorus) in the Chehalis River (and tributaries) for those portions of the project that are located in close proximity to the river and tributaries; the major portion of the levee and floodwall alignment is setback away from the river and tributaries. Any soil-disturbing activities during construction would be conducted in compliance with state-approved construction stormwater management plans. Past impacts have resulted in the majority of the concurrent water quality concerns (specifically, seasonal high temperatures and low dissolved oxygen). This project is not expected to degrade the current condition. Impacts from the preferred alternative are not likely to result in significant cumulative impacts to water quality as a result of construction.

After construction, the preferred alternative would have limited potential for impacts to water quality because of its setback location. The preferred alternative would not change normal flows or velocities of the river and tributaries, would not degrade existing conditions by being a source of contaminants, and/or would not result in changes to temperature, turbidity, and dissolved oxygen conditions. There would be some changes in the duration of larger magnitude floods within the Chehalis Valley study area, which may result in increased sedimentation, scour, and bank erosion. However, it would be difficult to differentiate specific impacts associated with the

preferred alternative because of the catastrophic nature of the flood itself. The preferred alternative may result in cumulative impacts to water quality during the flood events, but this would be episodic in occurrence and likely of short duration. As stated above, past impacts have resulted in the majority of impacts to water quality and the preferred alternative will not degrade the existing condition. As such, no significant cumulative impacts to water quality as a result levees and floodwalls in the Chehalis Valley and lower Skookumchuck River are expected.

Changes to the operation of the Skookumchuck Dam, which would result in changes to frequency and duration of floods on the Skookumchuck River, may result in cumulative impacts to water quality. Specifically, changes in the frequency of lower magnitude floods (5- and 10-year events) may change beneficial uses associated with riparian and wetland habitats. The major impacts associated with the Skookumchuck River have occurred from past actions, however, changes in operations may affect the current condition. This potential impact would be further evaluated during design.

No specific information is available on likely future development, including improvements to I-5. However, water quality on the Chehalis River is of concern to both state and local agencies and these projects would also be rigorously analyzed for impact avoidance and minimization.

Proposed mitigation plans for the preferred alternative, which include increased canopy cover and wetland creation and restoration should decrease summer water temperatures and improve dissolved oxygen conditions during low flow periods in the Chehalis River. These actions are intended to improve baseline conditions of the river. This action may help restore some of the historic functions of the Chehalis.

6.2.1.4 Biological Resources – Vegetation, Wetlands, and Riparian Areas

The preferred alternative would result in modification of Skookumchuck Dam and the modification of the floodplain through the construction of the levees and floodwalls. The floodplain modifications have been focused on avoiding unnecessary impacts to critical habitats (wetlands and riparian areas). The major impacts to wetlands and riparian areas occurred as a result of past actions. No information is available to evaluate the extent of future actions, although future projects, including I-5, are likely to result in wetland losses. Compensatory mitigation for the preferred alternative would increase the function and extent of wetlands and riparian areas as well as increase the overall vegetation biodiversity in the project area and may serve to offset cumulative impacts as well as restore some historic functions. Future development

that includes impacts to biological resources would likely require avoidance, minimization, and compensation measures. What remain unknown are the potential impacts to the wetland and riparian areas of the Skookumchuck River from the change in operation of Skookumchuck Dam. However, the potential for cumulative impacts would be associated with the first reach between the dam and the first tributary. This reach is the only reach on which a modified dam would have direct and cumulative impacts.

6.2.1.5 Biological Resources – Wildlife

The preferred alternative would result in the loss of land that could be potentially modified into habitat for wildlife, both within the alignment footprint and on the levees. In order for the levees to maintain their structural integrity, woody vegetation would be regularly removed thus reducing the potential use as wildlife habitat.

The proposed mitigation would increase the habitat for wildlife by creating additional riparian habitat, connecting oxbows, creating and restoring wetlands. This would restore some of the historic habitat for smaller wildlife species, although it would not restore habitat for larger species such as elk and deer. The major impacts from connectivity issues associated with the transportation corridors and development of the floodplain use are too large to be overcome by the preferred alternative, however, the project will not result in any degradation of existing conditions. No information is available on the extent of potential future actions, but these actions would be subject to avoidance, minimization, and mitigation requirements. No significant cumulative impacts to wildlife are expected.

6.2.1.6 Biological Resources – Fish

The preferred alternative would result in modification of Skookumchuck Dam and the modification of the floodplain through the construction of the levees and floodwalls. The floodplain modifications have been focused on avoiding unnecessary impacts to critical habitats (wetlands and riparian areas). The majority of impacts to fisheries are associated with past actions (floodplain modification and development, removal of LWD, habitat modification, etc.). The preferred alternative would not result in any degradation of existing conditions within the Chehalis River floodplain. Compensatory mitigation would increase biodiversity, improve fish habitat, increase primary and secondary productivity, and increase flood storage opportunities, which would restore some of the historic function. No information is available on the extent of potential future actions, but these actions would be subject to avoidance, minimization, and mitigation requirements.

What remain unknown are the potential impacts to the fishery support functions of the Skookumchuck River from the change in operation of the Skookumchuck Dam. No conclusions can be made regarding potential cumulative impacts to fish as this time, but this resource would be the subject of further evaluation during the design phase of the preferred alternative.

6.2.1.7 Land Use and Planning

Several design features of the preferred alternative are intended to minimize the impacts on land uses. The levees and floodwalls would be set back away from the Chehalis River and its tributaries to the greatest extent practicable, while offering protection to significant tracts of developed land. Existing roads, levees, and other structures would be incorporated into the design wherever possible to reduce impacts to these existing features. Additionally, floodwalls would be used in certain areas to minimize the footprint of the structure and to avoid impacts on existing buildings and infrastructure.

The preferred alternative has been designed so that it does not afford flood protection to large tracts of undeveloped land within the floodplain. This is consistent with Executive Order 11988, which requires federal agencies to minimize harm to floodplain areas and avoid adverse effects associated with incompatible development in floodplains. Further, these unprotected areas would not be expected to undergo urban-type development because they generally lie outside designated urban growth boundaries established under the state GMA. Undeveloped lands that would be protected as a result of the preferred alternative lie, for the most part, within urban growth boundaries and would undergo development in accordance with the local jurisdictions' comprehensive plans. These plans would be periodically reviewed and amended in accordance with the GMA.

The preferred alternative also incorporates modifications to the Skookumchuck Dam to aid in the reduction of peak flows during flood events. These modifications would provide additional flood control storage that would significantly reduce peak flood stages in communities downstream, thereby reducing flood damage to structures located in the floodplain. However, areas within the floodplain that are protected would only undergo development under the purview of comprehensive plans adopted under the Growth Management Act.

The dominant land uses in the study area are expected to remain agricultural and residential with a gradual increase in commercial and industrial land uses as the population in the area increases,

which is consistent with expectations of existing conditions. The design considerations incorporated into the preferred alternative would minimize the potential for impact to surrounding land uses. No information is available on the extent of potential future actions, but these actions would be subject to current and future land use requirements. No significant cumulative impacts are expected.

6.2.1.8 Recreation, Public Access, and Visual Resources

Cumulative impacts for recreation would involve dispersal of recreation activities to other areas, as opportunities under the preferred alternative would become limited during construction. However, recreational opportunities could return to areas immediately impacted as construction progressed to other areas within the study area. The preferred alternative will result in no changes to existing conditions. No information is available on the extent of potential future actions, but these actions would be subject to avoidance, minimization, and mitigation requirements. No significant cumulative impacts to recreation, public access and visual resources are expected to result from the preferred alternative.

6.2.1.9 Transportation and Traffic

The preferred alternative would result in the permanent modification of some roadways, including raising a portion of SR-6 and raising or relocating portions of arterial and secondary routes on top of the levees. However, the modifications would have a beneficial effect on transportation systems, since the preferred alternative would provide flood protection for the portion of I-5 that is currently subject to flooding, as well as protection for local roadways, the airport, and rail lines. This is a change from past conditions, but is considered a beneficial change. No information is available on the extent of potential future actions, but these actions would be subject to transportation and traffic analysis. No significant cumulative impacts to transportation and traffic are expected to result from the preferred alternative.

Although there would be temporary impacts on transportation during construction, the preferred alternative is designed to avoid unnecessary impacts and minimize unavoidable impacts to existing roadways and rail lines. Overall, the preferred alternative is expected to provide a significant benefit to transportation systems in the area. It would reduce flooding of local roadways, rail lines, and airport facilities, and provide the flood clearance that is needed in order to implement improvements to I-5 in the Centralia-Chehalis area. No significant cumulative adverse impacts to transportation are expected as a result of the preferred alternative.

6.2.1.10 Air Quality

The preferred alternative consists of passive flood control features. These features are not anticipated to generate air pollutants. There would be no change to existing conditions. No information is available on the extent of potential future actions, but these actions would be subject to avoidance, minimization, and mitigation requirements. No cumulative effects to air quality in the study area are expected.

6.2.1.11 Noise

Noise associated with the construction of the preferred alternative is temporary and does not contribute to cumulative effects to the study area. Long-term noise created by the operation and maintenance would be limited to periodic mowing. These structural features of the preferred alternative would not generate operational noise. No change to existing conditions is expected. No information is available on the extent of potential future actions, but these actions would be subject to avoidance, minimization, and mitigation requirements. No significant cumulative effects to the study area are expected.

6.2.1.12 Hazards and Hazardous Materials

Accidental spills of construction materials harmful to the environment, such as concrete, sealants, oil and other fuels, during construction of the preferred alternative could contribute to cumulative impacts on water quality. Although they would be infrequent and not intentional, accidental spills could occur during construction near stream channels or on the banks of stream channels.

The cumulative impacts of toxic contaminants would be less than significant because toxic material control and spill-response plans would be implemented for major construction projects in the watershed to avoid or control potential accidents. Hazardous waste mitigation measures would ensure that construction activities associated with the proposed action would not contribute to effects from hazardous materials on people or the environment. No changes to existing conditions are expected. No information is available on the extent of potential future actions, but these actions would be subjected to rigorous generation and handling controls if hazardous substances are associated with any proposed project.

The preferred alternative would not directly contribute to cumulative effects involving hazardous materials because this alternative would not include the long-term use, generation, storage, or disposal of hazardous materials. No significant cumulative effects to the study area are expected.

6.2.1.13 Cumulative Impacts on Cultural Resources

The preferred alternative has the potential to adversely affect historic properties or culturally important resources if they are present within the area proposed for project implementation. Historic properties are a finite resource; only some have survived the damages caused by time, natural degradation, and continuing land uses. The goal of federal resource protection is to preserve the best available examples of resource types. The preferred alternative is likely to affect prehistoric archeological sites, traditional cultural properties, or early settlement or industrial sites. There is potential to affect locations of cultural importance to tribes that are not encompassed by federal historic preservation law. The degree to which cultural resources would be affected is based on the actual footprint of the preferred alternative. The alignment of the preferred alternative is confined to the boundaries of urban development and set back from the river and major features of the floodplain (oxbow lakes and meanders). This may reduce the extent of the potential impacts.

The major factor of right of entry makes assessing the cumulative impact of the preferred alternative on cultural resources quite difficult and subjective. The data on cultural resources is uneven due mainly to the right of entry problems encountered during review of the known sites. Without testing, the actual subsurface character of most of the archaeological sites in the study area is unknown. Plus, lacking such information that can usually be obtained in settings like this by archaeological testing, the status of most of the sites in terms of eligibility for the National Registry is unknown. Potential cumulative impacts cannot be concluded at this time, but would be the subject of investigations during the design phase.

No information is available on the extent of potential future actions, but these actions would be subject to avoidance, minimization, and mitigation requirements.

6.2.1.14 Irreversible and Irretrievable Commitment or Resources

Construction of the proposed alternative will include many features considered permanent, or modifications to existing features. Project features that may be considered irreversible would be construction of the levees and the dam modifications. Resources that could be considered

irreversible and irretrievable would be the commitment of resources such as state and federal funding to purchase lands and labor, and to operate and maintain the alternative. At this time there are no commitments of resources that are irreversible and irretrievable except for the cost of producing this FEIS.

6.2.1.15 Relationship Between Short-term Uses and Long-term Productivity

While regional conditions may improve, short-term or localized conditions should improve after the initial impact of construction. Overtime the entire area should improve dramatically for existing wildlife resources. Further studies and monitoring will be critical to the over all recovery and maintenance of habitat for wildlife and fisheries in this area.

6.3 FINDINGS OF SIGNIFICANCE

No significant cumulative impacts are expected to occur due to the preferred alternative for hydrology and hydraulics, river geomorphology, wildlife, land use and planning, recreation, public access and visual resources, transportation and traffic, air quality, noise, and hazards and hazardous materials. In consideration of past, ongoing and reasonably foreseeable impacts, the project has the potential to cumulatively impact water quality, fisheries, and wetlands and riparian areas; additional study during design would be focused on potential cumulative impacts associated with the Skookumchuck Dam. Cumulative impacts to cultural resources cannot be concluded without additional study. This would be done during the design of the preferred alternative.

7. CONSULTATION & COORDINATION COMPLIANCE

Public involvement is a critical element in the feasibility of project development. Interested individuals, organizations, agencies, and governmental entities are solicited for comments and concerns relative to a proposed project. This chapter describes the Corps effort to establish dialogue with a variety of interests involved with the Centralia Flood Damage Reduction Project. The Corps in part is obligated to engage in this process through a variety of state and federal regulations. Discussion among interested parties is scheduled to continue through PED of the project as well as during the processing of this document. The Corps will consider the information collected in its decision making process to select a preferred alternative that has the least adverse environmental effect.

7.1 NEPA COMPLIANCE

Environmental, socio-economic, hydrologic and water quality information on this project has been compiled, and a DEIS for the Centralia Flood Damage Reduction Project was prepared from March to July 2002. A systematic interdisciplinary approach to planning has been utilized; all reasonable alternatives have been studied, developed and described; and all pertinent information, including hydrologic, environmental and water quality modeling and ecological field studies have been developed, carried out and utilized. The DEIS was coordinated with Native American tribes, state, federal and local agencies, non-governmental agencies, and the public for a period of not less than 45 days.

7.1.1 Public Involvement

The Corps has informed the public of the proposed project through several public meetings held in the affected area and press releases published in local print media. In addition to providing information to the public regarding the draft environmental impact statement (DEIS), the Corps solicited responses regarding the public's needs, values, and evaluations of the proposed alternatives. Both formal and informal input has been encouraged and considered by the Corps.

7.1.2 Scoping Process

A scoping process is a requirement of the environmental impact statement (EIS) preparation (49 Code of Federal Regulations [CFR], Part 1501.7). Scoping, as defined in the Council of Environmental Quality (CEQ) regulations of 1978, is “an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.” The scoping process facilitates:

- identification of issues, concerns, and possible impacts;
- identification of existing information sources;
- development of alternatives.

On 9 September 1999, the Corps initiated the scoping process by publishing in the *Federal Register* a Notice of Intent to prepare a DEIS on the Centralia Flood Damage Reduction Project. The Corps notified all potentially interested parties about the flood reduction DEIS scoping process, and provided opportunities to comment. The Corps also provided a press release about the scoping meetings to the news media and local newspapers.

7.1.3 Public Scoping Meetings

The Corps held two consecutive scoping meetings on 28 and 29 September 1999 in Rochester and Chehalis, Washington, respectively. At these meetings, the Corps presented the proposed alternatives currently under consideration and invited comments and suggestions for other alternatives to reduce flooding and minimize and or avoid potential environmental impacts.

7.1.4 Endangered Species Act, Section 7

Section 7 (a)(2) of the Endangered Species Act (ESA) of 1973 PL 93-205; 16 USC 1531 *et seq.*, as amended) requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) when a federal action may affect a listed threatened and or endangered species or critical habitat. The purpose of this legislation is to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of a species-critical habitat.

The Corps initiated consultation with the USFWS and NMFS, and, as required by Section 7 (a)(2), prepared a separate biological assessment (9 July 2002) addressing the potential effects on threatened and endangered species that occur and or may occur within the vicinity of the study area. The findings of the consultation have been presented in this Final EIS.

7.1.5 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (PL85-624; 16 U.S.C. 661 *et seq.*) (FWCA) requires federal agencies to coordinate with the USFWS and state wildlife agencies when planning new projects or when modification to an existing project occurs. The purpose of the legislation is to ensure that the welfare of wildlife resources receives appropriate consideration with other project objectives and features.

The USFWS has provided a final FWCA report regarding the flood damage reduction project, in accordance with Section 2(b) of the Fish and Wildlife Coordination Act, and it is included at the end of Chapter 9, Comments and Response to the DEIS. The draft FWCA report is included as Appendix F. The Corps has coordinated with USFWS on the proposed project through written correspondence (Planning Aid Letters) that was prepared on nine separate occasions between 21 April 2001 and 27 February 2002. The following paragraphs contain recommendations as presented in the Fish and Wildlife Coordination Act Report prepared by the U.S. Fish and Wildlife Service and responses to the recommendations prepared by the Corps.

7.1.5.1 U.S. Fish and Wildlife Service Draft Fish and Wildlife Coordination Act Report Recommendations

Comment 1. Details about the re-operation of the dam should include: a) the expected future water and power needs for the Centralia Steam Plant and the associated co-generation plant; b) the status of discussions between Lewis County and PacifiCorp for transferring flood control operating authority and/or ownership rights for the dam and reservoir; c) the potential for fish stranding in the reservoir during drawdown and how this could be minimized; d) the potential that insufficient water would be available to provide minimum flow requirements downstream; e) the likelihood of shutdowns in dam operation and severe ramping downstream; and f) the feasibility of providing overbank flows in excess of a 2-year event while limiting flows at the Pearl Street gage in Centralia to 5,000 cfs.

Response 1.a. There is no change in the future needs for water supply by the Centralia Steam Plant. The water right for the steam plant is 50 cfs at the point of removal from the river. The dam operation will need only to maintain this flow. In regards to the Centralia Steam Plant power needs, we are unaware of any future changes to the power that would require additional water supply rights from the Skookumchuck. In regards to the power facility at the dam, this power plant will be decommissioned by the new owners, a flood district (made up of Lewis county entities).

1.b. Lewis County and PacifiCorp are still conducting negotiations with the current owners for transferring the ownership of the dam to a flood control district that will operate and maintain the facility for flood control.

1.c. Reservoir operations are generally comprised of rules and constraints to address flood conditions and other conditions that are related to the pool and downstream impacts. If fish in the reservoir proper are a concern, reservoir draw during floods can be limited in rate and extent so as not to strand or otherwise take fish. Assuming there is a minimum pool that does not greatly diminish flood control, limiting evacuation to minimize stranding can be established as a constraint, just as the “turbidity pool” is a constraint at Howard Hanson Dam.

1.d. Minimum flows for downstream obligations are often a constraint that reservoir operations are required to meet. In flood season, reservoir operations are predicated on projected rainfall-runoff, reservoir pool, downstream channel conditions and inflow to the reservoir. Meeting minimum flow requirements during flood season should not be an issue and can be accommodated based on measured inflow and pool conditions. This could limit the ability for providing adequate minimum flows downstream. However, this condition would occur regardless of the dam configuration, assuming the refill rule is constructed to reflect current conditions.

1.e. During major floods, the objective is to limit the flow downstream to meet non-damaging conditions or constraints. Since the Skookumchuck Dam does not control the entire basin, the maximum flood reduction impact that could be achieved from the dam is to completely shut off the flow. However, if there are minimum low flow criteria immediately downstream of the dam (at least to the first flow contributing tributary), then dam operation rules would include those constraints as long as they do not impair or greatly diminish flood reduction benefits that justified the project. Further, ramping rates are typically imposed on the downstream channel so

as not to strand fish or create channel instability on ramping-down or create a health risk on ramping-up.

1.f. There may be opportunities for controlled channel exceedance as long as the operation does not, or can not be construed as, purposely contributing to damage. Current uncontrolled flooding that is unavoidable is one thing, but purposely flooding areas that we can not control once out of bank is not something we should do. However, if there are specific target out-of-bank flooding areas that can be controlled and that have been identified as having environmental benefits directly linked to out-of-bank flooding, we could configure overtopping “scenarios” that would take advantage of that linkage.

Comment 2. The following details should be provided to clarify design for the levee system: 1) a map showing the extent of existing levees and embankments, where these would be increased in height, and where new levees would be constructed; 2) maps modeling the extent of inundation at selected flood events, including 2-year, 5-year, 10-year, 35-year, 50-year and 100-year events for pre- and post-levee project; and 3) an assessment of downstream impacts caused by limiting floodplain storage for selected flood events and the distance downstream where those impacts might be evident.

Response 2.1. Maps for all the levee system will be produced prior to the preconstruction, engineering, and design (PED) planning and engineering phase of the proposed project and will contain the existing levees (all available data about their construction) and the planned new levees.

2.2. Most of these maps have been completed and presented to the environmental working group during the early phase of developing the criteria for the DEIS. However, a copy of those maps can be provided upon request.

2.3. There will be minimal impacts to the downstream portions of the Skookumchuck Dam based on the suggested re-operation plan. However, during the planning phase of this project any expected or suspected impacts will be assessed and evaluated for mitigation.

Comment 3. The Corps should provide details about the SR-6 bypass and restoration for our consideration during the preparation of this final document. We would like the opportunity to work with you in developing this component of the recommended plan. Our information needs include: a) details about the “concrete flowway” under SR-6 and ways of altering this concept to

provide better benefit to fish; b) flows predicted to provide access to the oxbow and to the bypass floodway; c) the potential for fish stranding and how that would be mitigated; d) the potential for fish loss due to entrapment and predation and ways of mitigating; e) anticipated maintenance needs; f) how much material would be excavated and where it would be placed; and g) the feasibility of purchasing land or obtaining conservation, erosion, and drainage easements to insure that restoration would remain viable.

Response 3.a. The concrete flowway under SR-6 will be designed to allow proper fish passage based on the coordination with the resource agencies, tribes, and other interested parties.

3.b. All flows will be better understood during the PED of the proposed project.

3.c. The project will be designed to protect fish and to help prevent fish from becoming stranded; therefore, mitigation will not be required.

3.d. During the PED phase of this project entrapment will be a major design consideration and all efforts will be put into place to reduce entrapment of fisheries. Predation is a natural process of fisheries and the project will not be designed to encourage predation; therefore, predation should not be mitigated for.

3.e. During the PED phase all maintenance needs will be identified.

3.f. This feature includes a 400-foot-wide excavation of SR-6, with an invert elevation of 179 feet. This would involve excavating and grading approximately 65,000 cubic yards of material, and elevating the roadway to provide clearance for reconnecting the floodplain by providing overbank flows; an environmental condition of significant importance to fish and wildlife species in the study area. The material removed, such as the construction materials, asphalt/concrete, etc., will be properly disposed of. Any material that can be utilized in the construction of the levees will be used.

3.g. A gross appraisal has been conducted in this area; the local sponsor will be required to purchase the property in fee.

Comment 4. All recommendations presented in the Corps' fisheries review document should be incorporated into the re-operation plan and the revised rule curve for the Skookumchuck Dam with the following exceptions or additions:

a) Rather than proposing the 2-year event as the maximum allowable flow in the river, we recommend that the Corps determine the flows at which critical functions occur (such as channel maintenance and the creation and maintenance of off-channel habitats) and work backward to determine how those natural flows can be incorporated. The Corps should work with resource agencies to determine critical functions.

b) Because the formation of new off-channel habitats along the Skookumchuck River may be diminished with the flood control project, the Corps should consider enhancing existing off-channel habitats and wetlands along the Skookumchuck River in addition to identifying and protecting them;

c) Alterations to the dam should include safe downstream passage for juveniles, smolts, and kelts, (i.e., adult steelhead that return to the ocean after spawning);

Response 4.a. It is unlikely that a maximum flow event of 2 years can be maintained due to the influence of the tributaries along the Skookumchuck River. Criteria for all fisheries and their habitat will be incorporated in the re-operation plan for the dam. All of these efforts will be coordinated with the resources agencies and tribes.

4.b. The Corps will look at all off-channel habitat on the Skookumchuck River and look at ways to enhance those areas. Areas of major importance to the environment will be reviewed to determine the potential for protecting that particular area.

4.c. Alterations to the dam will incorporate all possible safe passage designs for juveniles, smolts, and kelts.

Comment 5. The Corps should develop a monitoring and adaptive management plan that would set goals, report changes, and trigger changes in management of various aspects of the recommended plan. Issues that should be monitored include, but are not limited to, fish passage at the dam, functioning of restoration and mitigation projects, and alterations to downstream habitats resulting from changes in flows released from the dam. The plan should include monitoring for pre-project baseline, during construction, and post-project conditions and should be developed with participation from resource agencies. The monitoring plan should be developed to ensure that assumptions about fish passage and impacts from alterations of flows are correct.

Response 5. The Corps will develop a monitoring plan that will be developed with the coordination of all resource agencies and tribes associated with this project.

Comment 6. The Corps should develop a monitoring and adaptive management plan that would set goals, report changes, and trigger changes in management of various aspects of the recommended plan. Issues that should be monitored include, but are not limited to, fish passage at the dam, functioning of restoration and mitigation projects, and alterations to downstream habitats resulting from changes in flows released from the dam. The plan should include monitoring for pre-project baseline, during construction, and post-project conditions and should be developed with participation from resource agencies. The monitoring plan should be developed to ensure that assumptions about fish passage and impacts from alterations of flows are correct.

Response 6. See above response to Comment 5.

Comment 7. Fill that results from excavation of the floodplain should be placed outside the floodplain or used in the construction of the levees.

Response 7. Agree. The Corps is committed to utilize the material to the maximum extent practicable.

Comment 8. The existing embankments that will be part of the levee system and levees that will be newly constructed should be planted with native trees and shrubs to increase the value of these areas for fish and wildlife.

Response 8. In order to maintain the structural integrity of the levees it is not possible to plant trees and shrubs on the levees to increase values for fish and wildlife. If a tree were to die and the root system were to rot, there would be potential for a weak spot to develop in the levee. The levee's are being set back in order to meet the potential to develop areas between the levee and the river into functional riparian and wetland areas.

Comment 9. The Corps should clarify how non-structural measures will be implemented, including: a) details about how the "no net loss" of floodplain policy will be developed, implemented, and enforced; b) details about implementation of the moratorium/restriction on

further development in the floodway; c) status of the new floodplain maps; and d) how and when floodplain maps will be incorporated into land use practices by the county and city governments.

Response 9.a. The “no net loss” of floodplain policy will be developed with the active sponsor. The non-structural measures are discussed in Chapter 2, and how they are incorporated in the preferred alternative.

9.b. The moratorium/restrictions on further development in the floodway will be investigated during the planning phase of the project.

9.c. At this time it is the Corps’ understanding that FEMA will address that issue after the project is in the PED phase.

9.d. The use of floodplain maps has not been determined by the county and city governments. This area will be addressed in the PED phase of the project.

Comment 10. The Service, other resource agencies, and the tribe should be given the opportunity to participate in the development of a monitoring and adaptive management plan, a mitigation plan, design of restoration projects and dam operations and facilities that affect fish passage or fish habitat during the next phase of Corps planning.

Response 10. It is the intent of the Corps to include all the above-mentioned agencies, including the tribes, and to include members of the local community to be part of a working committee to insure all entities are involved in all phases of the project.

Comment 11. The Corps should evaluate the importance of groundwater recharge from flooding to base flows and the potential impact of reducing flood storage to base flows in the Chehalis River. Details should include groundwater movement, how soil types influence recharge, and location of important recharge areas.

Response 11. Please refer to the FEIS Chapter 4 for coverage of those issues. Plus, additional analysis will be performed if further review of all available data during the PED phase does not produce sufficient answers to the above comment.

Comment 12. The Corps should provide transfer funds during the next phase of study for our continued participation in developing a mitigation plan, restoration projects (including the SR-6

bypass complex), fish passage issues at the dam, groundwater study, sediment effectiveness studies for Skookumchuck River, design work for the levee system, and refining the plan for non-structural measures to be incorporated into the levee system.

Response 12. The Corps intends to continue to work closely with the Service to enable them to participate in the development of this project. A specific commitment per guidance under the Fish and Wildlife Coordination Act is not feasible at this time.

Comment 13. The Corps should revisit those restoration opportunities developed as part of the flood project to determine the feasibility of including them as part of the restoration actions proposed by the Chehalis Basin Study.

Response 13. All restoration areas that were developed are carried forward in the FEIS as potential restoration sites. Sites that are not used in this project could be utilized in the Chehalis Basin Study.

Comment 14. The Corps should obtain an evaluation by a geomorphologist to determine the potential for avulsion across the SR-6 bypass and the potential impacts should that occur.

Response 14. Those issues about or involving avulsion will be address during he PED phase of the project. All aspects of geomorphology will be addressed during that time.

7.1.6 National Historic Preservation Act Consultation and Native American Graves Protection and Repatriation Act

The National Historic Preservation Act of 1966 (NHPA) (as amended in 1992) requires that federal agencies consider the effects of a proposed project upon sites of historic significance. Section 106 of this act and its implementing regulations (36 CR Part 800) provides guidance that federal agencies can follow in order to be in compliance with NHPA on specific undertakings. The Archeological Resources Protection Act of 1979 and the Native American Graves Protection and Repatriation Act of 1990 are two other pieces of federal legislation promoting the protection of historic and archeological resources.

To comply with Section 106 of NHPA, federal agencies must consult with the State Historic Preservation Officer (SHPO), Native American tribes with a traditional or religious interest in the study area, and interested members of the public. Federal agencies must demonstrate that a

good faith effort has been made to identify historical properties in the area of potential effect for a project. Identified properties should be evaluated on the basis that they are eligible for the National Register of Historic Places. The effect of the proposed activity on eligible properties must also be determined at this time. The federal agency must consider how to address adverse effects on the characteristics that make a site “historic”. Cultural resource investigations will be ongoing to determine effects to historic properties during the planning phase of this project. When completed, results will be coordinated with the State Historic Preservation Officer and the Advisory Council on Historic Preservation.

7.1.7 Environmental Protection Agency

Coordination activities have been ongoing with the Environmental Protection Agency because of agency’s role in the National Environmental Policy Act (NEPA) review process.

7.1.8 Washington State Department of Transportation

Coordination activities have been ongoing with the Washington State Department of Transportation in conjunction with the department scheduled activities on the I-5 Improvement Project. Coordination will continue throughout the duration of the proposed project.

7.1.9 Washington Department of Ecology Dam Safety

The Washington Department of Ecology Dam Safety Unit would be provided an opportunity to review and comment on the proposed design and construction plans for the structural modification portion of the preferred alternative.

7.1.10 Executive Orders and Other Guidelines

Executive Order (EO) 11990 requires minimization of wetland destruction, loss, or degradation and preservation and enhancement of the natural and beneficial values of wetlands. Wetlands are recognized as important wildlife habitat resources and are necessary for the survival of a disproportionately high percentage of endangered and threatened species. A second requirement of EO 11990 is public disclosure of a project’s effect on wetlands. Chapter 4 of this FEIS provides that disclosure.

Executive Order 13007 (Indian Sacred Sites) requires the project proponent identify Indian sacred sites that may be affected by the project. The Corps has consulted with the Chehalis Tribe of Indians in a good faith effort to locate Native American sites of historical significance within the proposed project area. Efforts to identify Indian sacred sites are described above under National Historic Preservation Act Consultation.

Executive Order 12898 established environmental justice as a federal agency priority to ensure that minority and low-income groups are not disproportionately affected by federal actions. The Corps has invited minority and/or low-income members of the population within the project area to participate in public meetings. It has also been determined that minority and low-income groups would not be disproportionately affected by the proposed action. This is based on the projection that the largest anticipated economic impacts of project implementation would be because of project spending on construction, land purchases, operation and maintenance.

Executive Order 11988 requires agencies to avoid, where possible, short and long-term adverse impacts associated with floodplain development. Federal agencies are required to reduce the risk of flood loss and restore and preserve the natural and beneficial values served by floodplains. The Corps has no intention to engage in any action that would result in either short- or long-term impacts with floodplain development. Consultation with local Native American tribes has occurred from the beginning of the development of alternatives and will continue until completion.

7.1.11 Clean Water Act of 1972

The study is in full compliance at this stage. As the project progresses into the planning and development stage, a complete 404(b)(1) analysis will be conducted to ensure water quality standards will be maintained. This will precede the requirement of a state water quality certification that will be obtained prior to construction of any component that may impact wetlands or water resources of any kind. At present there is sufficient information to likely obtain a 401 certification from the state when the planning phase is in process.

Table 7.1: Table of Compliance

Law/Regulation/Treaty	Status of Compliance
National Environmental Policy Act (NEPA)	Will be complete after EIS is approved and ROD is signed.
Endangered Species Act	Consultation ongoing
National Historic Preservation Act	Consultation ongoing
Clean Water Act	A 404(b)(1) analysis will be prepared in PED and NPDES construction permits will be obtained
Clean Air Act	In partial compliance
Fish and Wildlife Coordination Act	In partial compliance
Migratory Bird Treaty Act	In partial compliance
Executive Order 12898, Environmental Justice	In partial compliance
Executive Order 11990, Protection of Wetlands	In compliance
Executive Order 11988, Floodplain Management	Will be completed prior to signing the PCA and starting construction.
Indian Treaty Rights	Will be in compliance through public review process
State Environmental Policy Act	Lewis County will adopt Final EIS
Washington Hydraulic Code	Lewis County will obtain required permits
Water Quality Certification	Corps will obtain required permits
Growth Management Act	In compliance
Model Toxics Control Act	Lewis County will obtain any necessary approvals
State Aquatic Lands Management Laws	Consultation ongoing
Lewis County Regulations	Lewis County will obtain all required permits
City Regulations and Ordinances	Lewis County will obtain all required permits

8. DOCUMENT RECIPIENTS

This Final EIS is being sent to federal, state, and local Native American tribes, interested non-government organizations and other interested parties. The FEIS is being sent to the same distribution list as the DEIS, as well as all groups and individuals who submitted written comments or who made comments at the public hearings. Other copies will be sent on request. This document is also available at local libraries in Chehalis, Centralia, and Montesano, Washington and on our web site: http://www.nws.usace.army.mil/ers/doc_table.cfm

8.1 FEDERAL AGENCIES (HEADQUARTERS OFFICES)

Advisory Council on Historic Preservation
ATTN: Mr. Ronald Anzalone
Advisory Council on Historic Preservation
Office of Prog. Review and Education
1100 Pennsylvania Avenue NW, #803
Washington, DC 20004-2501

U.S. Coast Guard
U.S. Coast Guard
Commandant
2100 Second Street SW
Washington, DC 20593-0001

Environmental Protection Agency
U.S. Environmental Protection Agency
Office of Federal Activities
EIS Filing Section
Mail Code 2252-A, Room 7241
1200 Pennsylvania Avenue NW
Washington, DC 20044

Federal Energy Regulatory Commission
ATTN: Mr. Pat Wood III, Chairman
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Department of Agriculture
U.S. Department of Agriculture
U.S. Department of Agriculture
14th and Independence Avenue SW, Room 200-A
Washington, DC 20250-0001

Forest Service
USDA Forest Service
PO Box 96090
Washington, DC 20090-6090

Department of Commerce
U. S. Department of Commerce
U.S. Department of Commerce
14th and Constitution Avenue NW
Washington, DC 20230

National Oceanic and Atmospheric Administration
ATTN: Mr. Steve Kokkinakis
NOAA
Office of Strategic Planning
Room 6121
Washington, DC 20230

National Marine Fisheries Service
National Marine Fisheries Service
NOAA Fisheries
1315 East West Highway, SSMC3
Silver Springs, MD 20910
Department of Energy
Office of Environmental Management
ATTN: Mr. Steve Frank
NEPA Compliance Officer
Division of NEPA Affairs
1000 Independence Avenue SW
Washington, DC 20585

Department of Health and Human Services
ATTN: Mr. Richard Green
U.S. Department of Health and Human Services
Cohen Building, Room 4700
200 Independence Avenue SW
Washington, DC 20201

Department of the Interior
Bureau of Indian Affairs
ATTN: Mr. Neil A. McCaleb
Interior Assistant Secretary - Indian Affairs
Bureau of Indian Affairs
1849 C Street, MS 4140
Washington, DC 20240

Fish and Wildlife Service
Department of the Interior
U.S. Fish and Wildlife Service
Public Information
Washington, DC 20001

Geological Survey
ATTN: Mr. Charles S. Groat, Director
U.S. Geological Survey
John W. Powell Federal Building
12202 Sunrise Valley Drive
Reston, VA 20192

Office of Environmental Policy and Compliance
ATTN: Mr. Willie R. Taylor
U.S. Department of the Interior
Office of Environmental Policy and Compliance
1849 C Street NW, M/S 2340
Washington, DC 20240

National Park Service
ATTN: Ms. Fran P. Mainella, Director
National Parks Service
1849 C Street NW
Washington, DC 20240

Department of Transportation
U.S. Department of Transportation
400 7th Street SW
Washington, DC 20590

Federal Railroad Administration
ATTN: Mr. Allen Rutter, Administrator
Federal Railroad Administration
1120 Vermont Avenue NW
Washington, DC 20590

Office of Management and Budget
ATTN: Mr. Mitchell E. Daniels, Jr., Director
Office of Management and Budget
725 17th Street NW
Washington, DC 20503

8.2 U.S. CONGRESSIONAL DELEGATION

Representative Brian Baird
Representative Brian Baird
Representative in Congress
Capital Hill, U. S. House of Representatives
Washington, DC 20515-4703

Senator Patty Murray
Senator Patty Murray
United States Senate
2985 Jackson Federal Building
915 Second Avenue
Seattle, WA 98174

Senator Marie Cantwell
Senator Marie Cantwell
United States Senator
717 Hart Senate Office Building
Washington, D.C. 20510

Representative Norman Dicks
Representative Norman Dicks
Representative in Congress
1717 Pacific Avenue, Suite 916
Tacoma, WA 98402-4411

8.3 WASHINGTON STATE LEGISLATURE

Representative Tom Mielke
ATTN: Representative Tom Mielke
Washington State House of Representatives
18th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Ed Orcutt
ATTN: Representative Ed Orcutt
Washington State House of Representatives
18th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Brian Hatfield
ATTN: Representative Brian Hatfield
Washington State House of Representatives
19th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Mark Doumit
ATTN: Representative Mark Doumit
Washington State House of Representatives
19th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Richard Debolt
ATTN: Representative Richard Debolt
Washington State House of Representatives
20th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Gary Alexander
ATTN: Representative Gary Alexander
Washington State House of Representatives
20th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Jim Buck
ATTN: Representative Jim Buck
Washington State House of Representatives
24th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Lynn Kessler
ATTN: Representative Lynn Kessler
Washington State House of Representatives
24th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative Kathryn M. Haigh
ATTN: Representative Kathryn M. Haigh
Washington State House of Representatives
35th Legislative District
PO Box 40600
Olympia, WA 98054-0600

Representative William Eikmeyer
ATTN: Representative William Eikmeyer
Washington State House of Representatives
35th Legislative District
PO Box 40600
Olympia, WA 98054-0600

8.4 FEDERAL AGENCIES-REGIONAL OR LOCAL LEVELS

Advisory Council on Historic Preservation
ATTN: Ms. Claudia Nissley
Advisory Council on Historic Preservation
Western Office Project Review
12136 West Bayaud Avenue, Suite 330
Lakewood, CO 80228
Department of Agriculture
U.S. Department of Agriculture
U.S. Department of Agriculture
1835 Black Lake Boulevard SW, Suite B
Olympia, WA 98501-5715

Forest Service

ATTN: Ms. Linda Goodman, Acting Regional Forester
USDA Forest Service – Pacific Northwest Region
7333 SW First Avenue
Portland, OR 97204-3440

Natural Resources Conservation Service

ATTN: Mr. Marty Cheney
USDA Natural Resources Conservation Service
300 Desmond Drive SE, Suite #106
Olympia, WA 98503-1273

Department of Army

U.S. Army Corps of Engineers
Forester Einarsen
CECW-PC
441 G. Street NW
Washington, DC 20314

Department of Commerce

National Marine Fisheries Service; Portland, Oregon
U.S. Department of Commerce
National Marine Fisheries Service
525 NE Oregon, Suite 500
Portland, OR 97232

National Oceanic and Atmospheric Administration

ATTN: Mr. Bob Lohn
Regional Administrator
NOAA
7600 Sandpoint Way NE
Seattle, WA 98115-0070

Environmental Protection Agency

U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

Federal Emergency Management Agency

ATTN: Mr. John Pennington, Region X Director
Federal Emergency Management Agency
Federal Regional Center
130 228th Street SW
Bothell, WA 98021-9796

Federal Energy Regulatory Commission; Portland, Oregon
Federal Energy Regulatory Commission
Regional Director
Portland Regional Office
101 SW Main Street, Suite 905
Portland, OR 97204

Department of Interior
U.S. Fish and Wildlife Service; Lacey
ATTN: Mr. Lynn Childers
U.S. Fish and Wildlife Service
510 Desmond Drive SE, #102
Lacey, WA 98503-1292

U.S. Geological Survey
ATTN: Mr. John "Doug" Buffington, Western Regional Director
U.S. Geological Survey
Office of the Western Regional Director
909 First Avenue, Suite 704, MS 150
Seattle, WA 98104

Department of Transportation
Federal Railroad Administration
U.S. Department of Transportation
Federal Railroad Administration
703 Broadway, #650
Vancouver, WA 98660

Federal Highway Administration; Portland, Oregon
ATTN: Mr. Pat Clark
U.S. Department of Transportation
Federal Highway Administration
222 SW Columbia Street, Suite 600
Portland, OR 97201

Federal Highway Administration; Olympia, Washington
ATTN: Mr. Daniel M. Mathis
Division Administrator
Federal Highway Administration
Evergreen Plaza
711 South Capital Way, Suite 501
Olympia, WA 98501-1284

o

Washington Department of Transportation
Becky Michaliszyn
P.O. Box 1709
Vancouver, Washington 98668-1709

8.5 INDIAN TRIBES

Confederated Tribes of the Chehalis Reservation
ATTN: Mr. David Youckton
Confederated Tribes of the Chehalis Reservation
PO Box 536
Oakville, WA 98568-9616

Northwest Indian Fisheries Commission
ATTN: Fran Wilshuaen
Northwest Indian Fisheries Commission
6730 Martin Way East
Lacey, WA 98506

Quinault Tribe
Quinault Tribe of the Quinalt Reservation
Business Committee
PO Box 279
Taholah, WA 98587-0189

8.6 STATE AND LOCAL GOVERNMENT AGENCIES

State of Washington
Department of Ecology, Olympia
ATTN: Ms. Barbara Ritchie; Mr. Dan Sokol
WA Department of Ecology
Environmental Review
PO Box 47760
Olympia, WA 98504-7706

Department of Fish and Wildlife
ATTN: Ms. Cynthia Pratt
WA Department of Fish and Wildlife
PO Box 45200
Olympia, WA 98504-3155

ATTN: Ms. Sue Patnude, Regional Director
WA Department of Fish and Wildlife - Region 6
48 Devonshire Road
Montesano, WA 98563

ATTN: Lee Van Tussenbrook, Regional Director
WA Department of Fish and Wildlife – Region 5
2108 Grand Boulevard
Vancouver, WA 98661

Department of Natural Resources, Olympia
ATTN: Mr. Doug Sutherland
Commissioner of Public Lands
WA Department of Natural Resources
PO Box 47001
Olympia, WA 98504-1004

ATTN: Mr. Dave Dietzman
WA Department of Natural Resources
PO Box 47015
Olympia, WA 98504-7015

Department of Transportation
ATTN: Mr. Larry Ross
WA Department of Transportation
Environmental Affairs Office
PO Box 47331
Olympia, WA 98504-7331

Governor
Governor Gary Locke
Office of the Governor
PO Box 40002
Olympia, WA 98504-0002

Office of Archaeology and Historic Preservation, Olympia
ATTN: Robert G. Whitlam
Office of Archeology and Historical Preservation
1063 South Capitol Way, Suite 106
Olympia, WA 98504-8343

Parks and Recreation Commission, Olympia
ATTN: Bill Koss
Parks and Recreation Commission
PO Box 42668
Olympia, WA 98504-2668

Utilities and Transportation Commission, Olympia
ATTN: Ms. Marilyn Showalter, Chairwoman
Washington Utilities and Transportation Commission
PO Box 47250
Olympia, WA 98504-7250

Chehalis River Council
ATTN: Ms. Margaret Rader, Chairwoman
Chehalis River Council
417 North Pearl Street
Centralia, WA 98531

Grays Harbor County
Grays Harbor County
Board of Commissioners
Grays Harbor County Administration Building
100 West Broadway, Suite #1
Montesano, WA 98536

Thurston County
ATTN: Ms. Cathy Wolfe, Chair
Thurston County Board of Commissioners
Thurston County Court House
Building One, Room 269
2000 Lakeridge Drive SW
Olympia, WA 98502-1045

Lewis County
Lewis County Board of Commissioners
500 NW Chamber of Commerce Way
Chehalis, WA 98532

Lewis County Conservation District
1554 Bishop Road
Chehalis, WA 98532

8.7 LIBRARIES

Chehalis
Chehalis Timberland Library
76 NE Part Street
PO Box 419
Chehalis, WA 98532-0419

Centralia
Centralia Library
Timberland Regional Library District
110 S Silver
Centralia, WA 98531-4296

Montesano
Montesano Library
Timberland Regional Library District
125 South Main Street
Montesano, WA 98563

8.8 MEDIA

Coordination through Seattle District Public Affairs Officer
David G. Harris, Chief of Public Affairs
U.S. Army Corps of Engineers
Seattle District
4735 East Marginal Way South
Seattle, WA 98124-3755

8.9 PRIVATE ORGANIZATIONS

Ducks Unlimited
ATTN: Ms. Mae Schultz, Regional Vice President – Region 16
Ducks Unlimited
Western Regional Office
3074 Gold Canal Drive
Rancho Cordova, CA 95670

PacifiCorp
PacifiCorp
825 NE Multnomah
Portland, OR 97232

Trout Unlimited
ATTN: Mr. Bill Robinson, Executive Director
Trout Unlimited
2401 Bristol Court SW
Olympia, WA 98502

Washington Forest Protection Association
Washington Forest Protection Association
724 Columbia Street NW, Suite 250
Olympia, WA 98501

Weyerhaeuser Corp.
Weyerhaeuser Corp.
PO Box 9777
Federal Way, WA 98063-9777

9. COMMENTS AND RESPONSES TO DEIS

SUBMITTED WRITTEN COMMENTS FROM 22 AUGUST 2002 PUBLIC MEETING

Comment 1:

Richard P. Thomas
738 SW Hillburger Rd.
Chehalis, WA 98532

I don't know who did your impact study, but I do know that there are more than 8 houses that would need to be raised with this plan. Also, this plan will put an additional (possible) 6"-12" of water in my house. In '96 we had 20 inches. That was more than enough thank you! You state that only 8 houses will need to be raised. What do we do with our livestock & farm equipment? We currently have a small area to put these items, but with your proposed increase, all will be in water for a greater amount of time. I am greatly disturbed with this plan & feel it is not a fair proposal for all. <signed>

Response: *It appears your house is very close to the confluence of the Newaukum and Chehalis Rivers (close to Chehalis RM 75). Based on the preferred alternative (Chehalis River Levees, flood control regulation at Skookumchuck Dam, levees along lower Skookumchuck, and the mitigation area that includes the 400-foot-wide SR-6 excavation), the post-project peak stages at your property will actually be lower than under current pre-project conditions. Peak flood stages could be up to 1.0 foot lower at your property during a 25-year event and roughly 0.6 foot lower during a 100-year event. The lower stages in this area under the preferred alternative are attributable to the proposed excavation under SR-6.*

The non-structural component of our project (raising adversely impacted homes) was based on screening residential structures outside the area of protection that might experience increased flood stages due to the project. This screening was based on comparing first floor elevations of all residential structures to the 100-year water surface elevation, with and without the project. Based on this evaluation, it was determined that 8 homes would experience increased flood depths averaging .34 foot with the project in place.

Comment 2:

Mary Swafford
1311 NW Airport Rd.
Chehalis, WA 98532

I am in favor of the plan that is recommended by Lewis County. Please give that plan every consideration as I feel it is the best for all concerned. <dated 8/22/02>

Response: *We appreciate your comment.*

Comment 3:

What is being done to cleanup & keep clean China Creek?

What is being done & how will any projects being done to lessen the impact of flooding in the N. Pearl area. The SR-507 is always impacted when it floods up by Carson & N. Pearl.

Response: *Clean-up of China Creek was not apart of the scope of this study. The Corps and the City of Centralia will conduct additional study, separate from this project, of China Creek flooding.*

Comment 4:

John P Penberth
PO Box 162
Pe Ell, WA 98572

1) The proposed ditch on Hwy #6 will move water away from Chehalis for a while and what happens when the ditch is full [during] deeper floodwaters? Fish will be trapped in this ditch.

Response: *This area of concern is part of the design process to ensure fish will not be trapped in the ditch.*

2) What land will be bought to put the dikes on?

Response: *A large portion of the proposed levee system design incorporates utilization of existing levees; therefore, much of the land purchased by Lewis County for the proposed levees will be under and/or near the existing levees. In addition, levee segments are proposed over parcels that include agricultural, residential and commercial land uses throughout the Chehalis/Centralia area. Therefore, there is a diversity of lands use types and locations that will need to be acquired by Lewis County to insure adequate real estate for the proposed levee system.*

3) Who will maintain the dikes, who will be responsible if the dikes fail or [are] not tall enough to hold the water back?

Response: *A local flood control district will maintain the levees. This group will be formed by the county and local communities.*

4) The ACE will destroy 34 acres of wetlands that are a natural part of this system. This is should NOT be done!

Response: *The only wetlands that will be impacted by the proposed project are prior converted wetlands that are now agriculture fields.*

Comment 5:

John P Penberth
PO Box 162
Pe Ell, WA 98572

1) The issue of downstream flooding (below Cent.) has not been properly addressed. Cent. & Cheh. will increase river height with the levee system and this could cause a higher rise down river FASTER.

Response: *The issue of potential impacts of the preferred alternative to reaches of the Chehalis River downstream of the project area (i.e., downstream of Centralia) has been studied extensively. In particular, the hydraulic model used to evaluate the Chehalis River in the vicinity of the project area was extended to reaches of the river downstream of Centralia to evaluate potential downstream impacts. While it is true that the addition of levees along the Chehalis River has the potential to cause slight (i.e., up to 0.5 foot) increases in peak water levels in the Chehalis River along a limited reach upstream of Centralia during large flood events, any potential effects of the levees on peak water levels downstream of Centralia will be offset by proposed flood control operations at Skookumchuck Dam. In particular, modifications to Skookumchuck Dam proposed as part of the preferred alternative will allow the Skookumchuck reservoir to be operated for flood control purposes. As a result, reduced flows in the lower Skookumchuck River as a result of flood control operations at the reservoir will offset any flow increases in the Chehalis River downstream of Centralia that are attributable to the proposed levees. The net result of the effects of all components of the preferred alternative will actually be a slight reduction in peak water levels in the Chehalis River downstream of Centralia during flood events.*

2) P.9 1.5.1.6 Reconsolidates tribes - What tribes? There is only one tribe, the Chehalis.

Response: *This should state "Confederated Tribes of the Chehalis." This will be corrected in the FEIS.*

3) 1.5.1.10 Refers to loss and degradation to critical habitat, why not the area outside of the "study area." What problems & loss will occur here?

Response: *During the preliminary studies that have been accomplished, there was no indication of significant loss or problems outside the study area.*

Comment 6:

John P Penberth
PO Box 162
Pe Ell, WA 98572

1) The placement of dikes will have a negative effect on critical fisheries within the Chehalis Basin.

Response: *The proposed levee alignments for this project have been intentionally and thoughtfully placed away from the river to allow for the establishment of natural riparian communities and floodway processes, and to significantly reduce levee impacts to aquatic resources. The location of levees in a floodplain could have a negative effect to fish resources if the levees were placed next to the water's edge. The further the levees are removed from the water's edge the more significant the reduction of impacts. There are a couple of locations however, that must be located near the water's edge principally due to the placement of Interstate 5. Mitigation that has been proposed will fully offset any potential impacts that may occur due to the location of the levees. These locations are near a bend in the Chehalis River and will have minimal impacts.*

2) P6.14 Why was 500-year floodplain used for the economic analysis? Never has the 500-year flood number been used. Nothing in this report is preparing for a 500-year flood and this is a major misrepresentation of facts to force the program on the taxpayers of this county and our country. This project is not about flooding; it's about economic development. As per ER 1105-2-100, "Planning Guidance Notebook", Appendix E.

3) Report Procedures For Risk and Uncertainty. To assist reviewers in assessing response to risk, summarize the following separately and display the information in tabular form:

a) Flood with two-tenths of 1 percent chance of occurrence. Fully describe the flood with two-tenths of 1 percent chance of occurrence (500-year frequency) with and without the plan.

The economic evaluation employs the discharge versus frequency curve, which ranges from a 0.999 frequency event (approximately 1 year) all the way up to a 0.001 frequency event (a 1000-year event). This is simply the range that a discharge versus frequency curve spans. A stage versus damage curve is also included in the economic analysis for determining the damages that can be expected, on average, in any given year. To be consistent, that stage damage curve needs to span the same range as the discharge versus frequency curve. A 500-year event is often used to define that upper limit for each curve and the 500-year floodplain is used to define the upper limit damages. Additionally, there are other requirements that mandate that we develop and display the 500-year event and associated 500-year floodplain. First, we have a requirement to show the 500-year floodplain, without the project and with the project in place, in an effort to show overall risk to a community. In other words, just how much area can be inundated in a very rare event (the 500-year is used for that) and what are the limits of that flooding. It is simply a way to show the citizens and decision makers the overall risk and to assess the response to that risk. And secondly, part of the requirements for a FEMA flood mapping effort is to show the 500-year floodplain limits. In summary, we have three basic reasons to develop and display the 500-year floodplain: the economic evaluation, the display of risk, and the mapping requirement for FEMA. This is certainly not to say that the project goal is to achieve a "500-year level of protection". The economic evaluation will determine what size of project is justified based on expected annual damages versus expected annual net benefits. The 500-year event is simply used to frame the upper limit for those evaluations and to define the limits of risk.

Comment 7:

B Ramacher
1330 NW River St.
Chehalis, WA 98532

According to your information paper, 20,000 acre-feet of water above the dam is dangerous - Liquefaction could occur on a 3.5 earthquake and there would be hell to pay downstream.

There has been lots of filling in floodplain - that wasn't allowed before the rules got changed.

I have lived here for over 58 years and there have been a lot of changes that weren't good and I could name who were responsible for that.

Response: *According to seismologists, if a magnitude 3.5 earthquake originated at or near the dam, the level of shaking would be near or less than 0.1g (gravitational acceleration). This is about what the dam experienced during the Nisqually earthquake last year. PacifiCorp, the dam owners, reported no damage. Our studies indicate that the soil, at the dam site are prone to liquefy when the level of shaking approaches 0.2 g. Therefore, FERC the regulatory agency responsible to ensure that the current owners are operating a safe dam, are reviewing the information available and will require the current owner to conduct additional tests, and if they conclude that there is a dam safety issue the current owner will be required to fix the dam. All of this will be done prior to the dam becoming part of the flood reduction project.*

Comment 8:

John C. Westall
325 NW Georgia Ave.
Chehalis, WA 98532-1209

I own 7 residences in the area between river miles 71 and 74 that are just south of the Chehalis-Centralia Airport. One is my own residence. There are many more houses in this area than the eight homes to be raised. What criterion was used to select 8 houses out of the many in the area? What compensation will be forthcoming to the others in the area that will see a raise in flood levels. My wife and I have gone to considerable expense to raise our home and the other rental homes that we own. Present level of our houses, while affording protection from floods, will be less adequate with increased levels. Using taxpayer money to increase our vulnerability to flood damage without due compensation is unethical - if legal. All the homes in the area should be raised at least as much as the increase in flood level.
<signed>

Response: *The non-structural component of our project (raising adversely impacted homes) was based on screening residential structures outside the area of protection that might experience increased flood stages due to the project. This screening was based on comparing first floor elevations of all residential structures to the 100-year water surface elevation, with and without the project. Based on this evaluation, it was determined that 8 homes would experience increased flood depths averaging .34 foot with the project in place.*

Comment 10:

Dave Palmer
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Thank you for the opportunity to comment on the Draft EIS for the Centralia Flood Reduction Project.

I have been involved in the rivers of the Chehalis system for many years.

As a resident I had floodwaters in our house during the 1990 (2 inches) and 1996 (2 feet) floods. Any time the Chehalis gage at Grand Mound reaches 15 feet we can count on being confined to our home by floodwaters. The 1996 flood cost over \$40,000 in damage and repairs and we fully understand the concerns of residents in Centralia and Chehalis.

I've a well established record as a watershed volunteer. I played a role in the creation of the Chehalis River Basin Action Plan (1990) and I founded the Chehalis River Council in 1994 and served as Chairman of the Board of Trustees until my retirement last year. It was in 1997, at the Chehalis River Council office and at the invitation of the CRC that county representatives of Thurston, Lewis and Grays Harbor first met to discuss flooding issues and solutions.

These comments concerning the Draft EIS are based upon a desire to see a river system, which supports traditional river uses. I also want residents to safely enjoy the benefits of a healthy watershed without concern for the flood protection efforts of their neighbors. My concerns deal with downstream impact, appropriate land use restrictions, "no net loss" of flood capacity and the safety of the Skookumchuck Dam. Each of the following is an item which I feel has to be resolved in order to obtain approval of this Draft EIS and/or before federal funding is provided.

A. All flood events are my concern. I do not have enough information to predict what the impact of longer periods of high water will do to our property and access to our home. Reducing the flood impact in one area only increase it somewhere else.

In the -"Appendix A: Hydrology and Hydraulics of the Draft General Reevaluation Report, July 2002"--- it was written: "The cumulative effects of all the changes are insignificant. Comparing with the results of the 15 May 2001 model, the maximum change in stage is less than 0.5 foot at high water calibration points listed in table 3-4. The accuracy of the computed water surface elevation is within 0.5 foot compared with observed high water marks." Insignificant? Remarks like that help me to understand the writer has never endured a flood. 6 inches can make the difference between a loss of a car engine, loss of hardwood floors or wall to wall carpeting or the loss of a heat pump.

I am concerned that here at the confluence of the Black River and Chehalis River we will see the combined impact of upstream levees as well as the longer sustained releases from the proposed Skookumchuck Dam operation.

Response: *The issue of potential impacts of the preferred alternative to reaches of the Chehalis River downstream of the project area (i.e., downstream of Centralia) has been studied extensively. In particular, the hydraulic model used to evaluate the Chehalis River in the vicinity of the project area was extended to reaches of the river downstream of Centralia to evaluate potential downstream impacts. While it is true that the addition of levees along the Chehalis River has the potential to cause slight (i.e., up to 0.5 foot) increases in peak water levels in the Chehalis River along a limited reach upstream of Centralia during large flood events, any potential effects of the levees on peak water levels downstream of Centralia will be offset by proposed flood control operations at Skookumchuck Dam. In particular, modifications to Skookumchuck Dam proposed as part of the preferred alternative will allow the Skookumchuck reservoir to be operated for flood control purposes. As a result, reduced flows in the lower Skookumchuck River as a result of flood control operations at the reservoir will offset any flow increases in the Chehalis River downstream of Centralia that are attributable to the proposed levees. The net result of the effects of all components of the preferred alternative will actually be a slight reduction in peak water levels in the Chehalis River downstream of Centralia during flood events (i.e., this slight reduction in peak water levels during flood events would also occur in the Chehalis River at the confluence with the Black River).*

Under the preferred alternative the Skookumchuck reservoir will be operated to store floodwater during the peak of a flood event. Water will be released from storage to the Skookumchuck River once the downstream flood threat has sufficiently subsided (i.e., releases of stored water will be made primarily based on river conditions downstream of the dam in both the Skookumchuck and Chehalis rivers). Releases will be made to evacuate stored water from the reservoir in a reasonable amount of time to make storage space available in the reservoir for future flood events without aggravating downstream flooding in either the Skookumchuck or the Chehalis rivers.

What are the downstream impacts created by the loss of upstream floodplain storage? How far downstream will they be felt? How will longer periods of standing water change our pastures?

Response: *With the exception of some of the proposed levee sections along the lower reach of the Skookumchuck River, most of the proposed levee sections will be set back significantly from existing stream channels. This limits the loss of floodplain storage attributable to the project. For instance, proposed levees along the Chehalis River will be mostly set back significantly from the east side of the channel (there is no levee along the west side of the channel) and will be mostly situated adjacent to I-5. As a result, flooding in the active portion of the existing floodplain on the west side of I-5 under the preferred alternative will be very similar to pre-project flooding (i.e., the spatial extent and depth of flooding will be largely unchanged). The most notable change to flooding along the Chehalis River under the preferred alternative is that flooding will be greatly reduced in the mostly urban areas along the east side of I-5. Most of the areas on the east side of I-5 that have historically flooded from the Chehalis River have generally functioned mostly as backwater storage areas during flood events and have had very*

limited function in terms of providing downstream conveyance of flood flows. As a result, potential increases in peak water levels upstream of Centralia during flood events attributable to lost floodplain storage as a result of the proposed levees would be slight (i.e., generally several inches or less) and would be limited to a relatively short reach of the river. As discussed in the previous response, operation of the Skookumchuck reservoir for flood control purposes will offset any downstream flow increases in the Chehalis River attributable to the proposed levees. The net result of the effects of all components of the preferred alternative will actually be a slight reduction in peak water levels in the Chehalis River downstream of Centralia during flood events.

B. I have long spoken out in favor of land use regulations that prohibit development in the areas that flood frequently. I believe any solution to Chehalis flooding has to incorporate stringent land use restrictions by tribal, county and city government. Local government has to stop using outdated FEMA maps.

C. "No net loss" of flood capacity must become a cornerstone of development in this three county area. However it is done we have to educate planners, developers and builders in the proper mitigation techniques. For example: digging a hole in a floodplain does not mitigate fill in the same floodplain.

D. Item 1 (in the attachment) recites a number of my questions and answers from the Corps of Engineers. Many of these question/answers seem to relate to the economic component of the proposed plan. In short does the county, the operator, or the taxpayer know the real cost of this project -especially when the dam safety issue has not been resolved?

- One has to be concerned that there is no known operator of the proposed dam.
- When will taxpayers learn about the creation of a local flood control district?
- When will taxpayers learn about their real estate tax paid share of the dam operating costs?
- When will taxpayers learn about their real estate tax paid share of levee maintenance costs?

Response: *Costs for operating and maintaining the dam have been included in the costs for the project and the local sponsor is aware of these costs. The costs will be finalized in the project cooperation agreement to be signed by the local sponsor prior to implementation of the project. The county and local cities will be working with communities to form a flood district. The timeline for this is unknown at this time, but will be further addressed during design.*

E. I am not convinced that all the facts are publicly known about the Skookumchuck Dam modifications and dam safety or failure. Even the Draft EIS (Item 2) hides the issue.

- The dam is described (Draft EIS, Skookumchuck Dam Re-operation Report, Appendix B, page 5) as a current capacity of 35,000 acre feet within a 540 acre reservoir at a maximum elevation of 477 feet mean sea level.

- The additional 15 feet of elevation would add an additional 9,000 ac-ft (Draft EIS page 23) or a very significant 25.7"10 increase over the current dam capacity.
- Item 2 and Item 3 (in the attachment) describe the same test scenarios. Item 3 specifically identifies "liquefied soils" and "factor of safety less than 1".
- Item 3 defines a remediation effort that will be 100 percent cost to the current owner and the costs are not NED costs and are not included in the cost estimate for the selected plan.
- It seems that major work remains to be done to identify and correct deficiencies related to structural dam safety. I am concerned that the environmental impact and the economic impact of this issue are not sufficiently documented or known.

Response: *The additional 9,000 acre-feet of storage is within the dam's capacity but above the spillway's capacity. There are current potential dam safety issues that are being reviewed by FERC the regulator of the dam, by the current owner and the Corps. The dam will not be incorporated as part of a federal project until the Corps is satisfied that the dam safety issues have been resolved or mitigated for at the dam. Any costs of dam safety work will be the responsibility of the current owner.*

To summarize, as a "downstreamer" I am very concerned about downstream impact, land use, no let loss of flood capacity and dam safety. I appreciate the opportunity to share these concerns.
<signed> Dave Palmer

Appendix to letter:

Item I: While attending a public Draft EIS meeting (July 9, Chehalis, W A) I submitted a number of questions. I received a response on August 29 from Leslie Kaye, Public Affairs Specialist Seattle District Army Corps of Engineers. These selected questions and answers are reproduced here.

1) What agency will own, operate and manage the dam?

Answer: Local flood control district

2) Who has ultimate authority to operate the dam?

Answer: PacifiCorps owns the dam. They are seeking a buyer an/or agreement to purchase from Lewis County. During times of flooding, the Army Corps reservoir Control Center will regulate the operation of the dam.

5) What is the annual dam maintenance cost?

Answer: The annual operation and maintenance project costs are estimated at \$600,000

6) Is dam maintenance cost budgeted, approved and allocated?

Answer: It is a part of the project costs; the O&M is the responsibility of the dam owner.

7) Is the dam maintenance cost paid by all taxpayers or just those who benefit?

Answer: This would be the responsibility of the flood control district

9) How much will it cost to maintain the levee system? Who pays? Is it budgeted?

Answer: Levee maintenance cost is estimated at \$8,000 per mile/per year. Fifteen miles of levee are planned for the flood reduction in this area. Therefore the approximate cost per year for maintenance would be \$120,000. This would be the responsibility by a local flood district.

10) Who maintains the levee?

Answer: Flood Control District.

11) How is the property for the levee system obtained?

Answer: The Local Sponsor is responsible for acquisition of property and easements; this is part of their local share. However, during construction a Right-of-Entry issued by the Army Corps of Engineers Real Estate Section is distributed to any private or commercial landowner. The property owner then has the choice to allow or not allow the government to access their land to build/construct the levee.

Correction: *Actually, it is during the feasibility or planning and design phases of a project when rights-of-entry are sought from landowners within study areas. Landowner cooperation is voluntary during the study phase and may refuse to grant the county or the Corps permission to conduct investigations on their lands.*

Once the project construction phase begins, the county will begin acquiring project lands. Easements will be sought for levee elements and fee simple interests acquired for mitigation lands. Lewis County will contact affected landowners regarding lands that are needed for the project. The county will then conduct real estate appraisals of necessary lands, and make offers to landowners for purchase of such lands.

12) How much will the levee improvement add to the value of a typical house inside the levee area?

Response: *Detailed amounts or percentages would have to be obtained by the county assessor's office, but generally speaking flood insurance cost will decrease and land value will increase.*

13) Will homes and property in the outside unprotected area be granted a property tax relief?

Response: *This is another question for Lewis County.*

Item 2: "Skookumchuck Dam: The geotechnical studies for Skookumchuck Dam included a site-specific ground motion study due to increased estimations of the seismic risk in the Pacific Northwest. Past seismic studies were evaluated using present state-of-the-art practice and existing literature. A seismic analysis of the dam embankment stability based on dynamic loading methods followed the ground motion study. A soil exploration program was conducted beneath portions of the downstream dam embankment berm to determine liquefaction susceptibility of dam foundation silt and alluvium. An exploratory core-drilling program was conducted to support rock cut slope stability and dewatering." (USACE DEIS July 2002 pg 11)

Item 3: "During original construction of the dam, while stripping the foundation, a deposit of silt north of the original river channel was discovered. The initial exploration programs for the dam

did not reveal the silt layer. An exploration program was undertaken to define the extent and thickness of this silt deposit. A decision during construction of the dam was made to leave the silt layer alone. After 20 to 25 feet of embankment material was placed on the silt layer, there were indications that embankments would become unstable in their original design. It was judged that the silt body could be contained and stabilized by adding massive toe berms where the embankment shells are founded on the silty clay material; these were constructed.

"In the investigations conducted by the Corps in 2001, based on recent seismic information, the study concluded that the sandy gravel soils underlying the silts appear to be liquefiable under all design Maximum Credible Earthquake (MCE) ground motions. In 2001, a similar stability analysis was performed utilizing subsurface explorations, the liquefaction data, and seismic hazard analysis from recent studies. This included evaluation of the existing static and post - seismic stability of the downstream slopes of the dam and berm using a limit-equilibrium approach. The extent of liquefied soils is uncertain beyond the area of investigations with Becker and SPT borings, thus slope failures were calculated for five different ranges of liquefied soils. The calculations indicate a factor-of-safety below 1.0 for conditions where liquefied soils are present from the core to the toe of the downstream berm.

"Currently, FERC is reviewing the information provided by PacifiCorps (the current owner) as required by the regulatory permit for operating a hydroelectric facility and the results of the Corps investigation described in the above paragraph. Based on a May 17th meeting with FERC, the regulatory agency will be issuing a letter to the owner in June 2002 recommending that they conduct further investigations to determine the extent of the liquefiable material. Based on this investigation the owner will be required to conduct remediation to the downstream berm to ensure that the dam meets dam safety requirements in a post seismic event. The current owner prior to the local sponsor taking ownership of the facility will conduct this effort. This remediation effort will be 100 percent cost to the current owner and the costs are not NED costs and are not included in the cost estimate for the selected plan." (USACE DGRR, July 2002, pg 163-164)

Comment 12:

Chehalis River Council
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I am making these comments on behalf of the board of trustees of the Chehalis River Council, a grass-roots, all volunteer environmental organization dedicated to the preservation and conservation of natural resources in the greater Chehalis River Basin. We are concerned about water-related issues in the entire Basin, from the headwaters near Pe Ell to Grays Harbor.

The Chehalis River Council is pleased that we have finally reached a stage in the Flood Reduction Study that has promise of leading to actual construction of at least partial solutions to Lewis County's flooding problems. As a basic position, we agree that the preferred alternative is

the best choice to protect the environment while at the same time providing cost-effective flood protection.

We would have liked to have seen the non-structural methods combined with the levee approach since these would be complementary and contribute to flood stage reduction. The EIS incorrectly states that watershed management and reforestation do not affect flood stage elevations (page 34, Evaluation of Alternative 6, non-structural methods for flood reduction). Improving land cover conditions in the watershed would add storage and attenuate hydrographs, resulting in lower flood levels.

Response: *The DEIS states these measures do not directly affect flood reduction. Any type of watershed management and reforestation will have some type of impact on flood reduction.*

Additional comments and questions on the Draft EIS follow:

Section 2.4, Evaluation of Alternatives, pages 41-48: This section needs a systematic evaluation of how each alternative meets the environmental criteria (criteria 8 -avoid adverse impacts, and criteria 9 -incorporate fish and wildlife habitat creation, enhancement, and restoration), similar to the evaluation table provided for monetary benefits and costs.

Response: *This has been revised in the FEIS.*

Non-structural features of the preferred alternative (page 55): The City of Chehalis ordinances do not appear to prohibit development within the floodway. Would this be addressed as a condition of the project? The text recommends compensatory storage requirements for fill in the floodplain, but ordinances in Centralia and Chehalis allow uncompensated fill in the floodplain fringe. Would this be addressed as a condition of the project?

Response: *The local sponsor is required to develop a floodplain management plan that incorporates the flood damage reduction project, per Executive Order 11988. This management plan has to be completed prior to any construction of the project starting.*

Potential Restoration Sites (page 57): This section lists ideas for restoration sites but does not provide a measure for how much restoration should be done. With no measure of success, it is possible that restoration elements would be the first to be cut if the project budget becomes tight.

Response: *These sites have been evaluated for what habitat they would provide for the cost of constructing them. This evaluation will be utilized to determine the order of constructing them. In addition, the Chehalis Basin Ecosystem Restoration Study will also be considering these sites. Therefore any site that does not get constructed under the flood damage reduction project could be constructed under the ecosystem restoration project.*

Water Quality (page 89): The TMDL section should also mention the Department of Ecology's Fecal Coliform TMDL in Grays Harbor, which identifies the upper Chehalis watershed as a major source of fecal coliform in the Grays Harbor estuary.

Geomorphic Impacts of Skookumchuck Dam modifications (page 174): As the text states, the dam will affect the hydrologic regime of the Skookumchuck River and will have impacts on river geomorphology. These potential impacts need to be defined in more detail so that appropriate mitigation can be defined.

Response: *Based on the review by the Corps Hydrologist the potential impacts to the Skookumchuck River will not change over what they are without the project. In other words the area of impact will be between the dam and the first tributary as it occurs now.*

Ongoing monitoring and evaluation. The plan needs to describe a mechanism for ongoing monitoring and evaluation of flood impacts, both in the project area and downstream. Climate change in the future may lead to a need to reevaluate modeling parameters, and downstream impacts need to be assessed after completion of the project to ensure that the project indeed does not worsen flood conditions in the Rochester/Grand Mound/Oakville area. If there is more downstream impact than expected, there should be provision written into the project for some kind of mitigation.

Response: *In the formulation of the project the future climate is evaluated. The method of doing this is to evaluate the project under a wide variety of flood events (2-year up to 500-year events). This allows us to evaluate the benefits/impacts of the project under a very wide variety of conditions. Therefore a climate change wouldn't necessitate a need to re-evaluate modeling parameters. The primary impact of future climate change from a hydrologic standpoint would be potential changes to the flood-frequency relationship. For example, if future climate change were to cause us to adjust the 100-year peak flow estimate at Grand Mound to 85,000 cfs (as an example), this would still be within the range of flood events that we have already evaluated (our current estimate of the 500-year peak flow at Grand Mound is on the order of 100,000 cfs).*

We appreciate the opportunity to comment on this important project.

<signed>

Margaret Rader
Chair, Board of Trustees,
Chehalis River Council

Comment 13:

United States Department of the Interior
Office of the Secretary
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 356
Portland, Oregon 97232-2036

The Department of the Interior has reviewed the Centralia Flood Damage Reduction Project Draft Environmental Impact Statement (DEIS). We offer the following comments with regard to your agency's proposed project.

Project Description

The proposed project is intended to provide flood hazard protection for I-5 and the cities of Centralia and Chehalis in Lewis County, southwest Washington State. Since 1998, the Western Washington Fish and Wildlife Office (FWS) has been actively involved in planning for this project. Detailed comments were provided to the U.S. Army Corps of Engineers in a draft Fish and Wildlife Coordination Act Report (CAR) dated July 10, 2002.

General Comments

The proposed project includes two major components: 1) a setback levee system and 2) modifications to the operation of Skookumchuck Dam. As described below we support the setback levees, and our support for the modification to the dam is qualified.

With respect to the setback levee system portion of the project, we support the selection of the setback levee as the least environmentally damaging alternative, as summarized in the CAR. This position is based on the fact that the setback levees would primarily be upgrades to existing levees. Where new levees are constructed, they would generally be set back from the river to allow natural floodplain function, and consequently would limit the opportunity for further urban development of the floodplain. With the incorporation of the FWS' s recommendations about non-structural measures and mitigation and restoration features, we believe this portion of the recommended plan could result in benefits to fish and wildlife. Our anticipation of beneficial results is tempered, however, by the fact that many details remain to be developed, including design details of the Scheuber Ditch/SR-6 bypass and restoration, a mitigation and monitoring plan for the project, and other issues detailed in the CAR.

With respect to modifications to operation of the Skookumchuck Dam, we have concerns about the potential impacts to channel processes, spawning and rearing habitat and riparian and wetland systems that could occur from alteration of flows in the Skookumchuck River. In certain instances, the DEIS concludes that the effects will be insignificant but provides no supporting evidence for that conclusion. We urge the Corps to take the necessary time to scope and conduct studies for determining impacts in the Skookumchuck Basin and to work with resource agencies and tribes to develop a mitigation and monitoring plan once those impacts have been fully evaluated. Given the uncertainties about impacts in the Skookumchuck River, our support for the dam modification depends upon a defensible demonstration of the insignificance of those impacts or else a high level of mitigation and restoration in that sub basin to offset those uncertainties. We also recommend the Corps demonstrate a strong commitment and financial backing for monitoring and adaptive management.

Response: *The Corps of Engineers will develop a monitoring plan and use adaptive management for the mitigation area being developed for the proposed project. Additional hydraulic studies of the Skookumchuck River will occur prior to development of the project. Adaptive management will be implemented based on those findings.*

As the Corps enters the Preconstruction Engineering Design phase of planning, we recommend including the FWS, other resource agencies, and the tribes in developing more specific plans and

designs for those project features related to fish and wildlife habitat, including: 1) the re-vegetation projects along the Newaukum and Chehalis Rivers, 2) the Scheuber Ditch/SR-6 bypass and restoration, 3) relocation of Dillenbaugh Creek, 4) development of a rule curve for the revised operation of Skookumchuck Dam, and 5) work on new or existing levees adjacent to the river in order to investigate the feasibility of incorporating fish benches, large woody debris, and riparian vegetation. In addition, we note that sizeable impacts to wetlands would occur from the proposed setback levees. We recommend that the Corps work with the resource agencies and tribes to determine how these impacts to wetland area and function can be avoided, minimized and, for unavoidable impacts, compensated. This information should be included in the Final EIS, or potentially in a Supplemental DEIS.

Response: *The Corps will continue to work with the same working group that was heavily involved in the development of this proposed project.*

Specific Comments

We provide the following specific comments about the DEIS. We have provided page numbers for more detailed discussion about certain topics in the CAR.

Page 16. Section 2.1.2. Alternatives Development: The "Alternative Proposed by interagency Committee," also known as the "Alternative Subcommittee alternative," should be described as a sequential process that first looks at non-structural means of reducing the risk of flood hazard and then goes on to evaluate the increase in flood protection from structural measures. We believe it is important to capture this idea. The intent, as we understand it, was to determine environmentally benign ways in which flood risk reduction could take place and apply those measures first. Structural components, which generally have greater impacts, would be added only as needed to provide flood risk reduction necessary for the project.

Response: *The description of Alternative 7 in Section 2.3 emphasizes that "Alternative 7 focused first on reducing flood hazards and increasing floodwater storage through regulatory and voluntary measures. The connectivity of the Chehalis River to its floodplain would be maintained and enhanced using land use and development regulations before implementation of any costly structural solutions... Finally, Alternative 7 included a sequence of actions that required analysis before additional actions would be proposed." The Corps believes that this discussion captures the idea of the sequential process that is the basis of Alternative 7.*

Page 17. Section 2.1.4: The FWS understood that non-structural measures were to be incorporated along with restoration measures in all alternatives. This concept should be stated in this paragraph.

Response: *As noted in the description of Alternative 6 (Non-structural Alternative) in Section 2.3, non-structural flood management measures would be incorporated into any recommended plan; however, they were not a part of all of the original alternatives. Therefore, this paragraph will remain as originally written.*

Page 19. Section 3: Please edit the last sentence for clarity, as the meaning is not clear.

Response: *The sentence will be edited as requested.*

Page 45. Section 2.4. Paragraph 2. Sentence 2: Our understanding is that the moratorium on floodplain development would be incorporated as a mandatory condition of federal assistance, not an optional measure. The Corps and public agencies have undertaken an enormous effort to assess alternatives that will reduce the risk of flood hazard. Meanwhile development and fill of the floodplain has continued unabated, meaning that much of this planning will need to be revisited prior to construction. Our concern as it relates to fish and wildlife is that floodplain development alters hydrology and channel dynamics, reduces floodplain functioning and destroys habitat. We recommend that a moratorium be placed on further development of the floodplain until the new Federal Emergency Management Agency maps, based on a more accurate and current estimation of the extent of flooding, can be adopted by the local jurisdictions. The Final Environmental Impact Statement (FEIS) should capture the discussion that went into the development of this measure, and if the moratorium will not be mandatory, the FEIS should explain why.

Response: *A moratorium on further developments is not within the regulatory jurisdiction of this agency. A discussion will be added to the FEIS regarding a moratorium on development. FEMA is currently moving forward with development of new floodplain mapping that will be more accurate than the current mapping.*

Page 55. Restriction of Fill in the Floodplain: See the comments on page 53 in the CAR. The wording of this requirement needs to be carefully developed to ensure that the intent of this measure is captured. Development and fill of the floodplain in the Chehalis Valley has continually encroached upon the river. Our understanding is that this measure was supposed to promote "no net loss" of floodplain function by mitigating any new fill with removal of fill that was previously placed in the floodplain.

Response: *It is the understanding of the Corps that the current ordinances of the local communities, within the project area, are to promote the no net loss. This is conducted by mitigating any new fill with the removal of fill from the floodplain as stated on page 56 of the DEIS.*

Page 69. Section 3.1. Hydrology and Hydraulics: This section mostly addresses surface water hydrology and flooding, but does not address the relationship between groundwater, flooding, aquifer recharge, hyporheic flows, and base flows. We recommend that the discussion on groundwater recharge on page 170 and 171 be relocated to this section. Also, because many questions have arisen about groundwater movement and the effect of the project on groundwater/aquifer recharge and base flows, we recommend that the conclusions made here be supported by reference.

Response: *Thanks for your suggestion. The Corps believes the locations should remain the same as they work best for this document.*

Page 80. Section 3.2.2.4: Please define the term "core reach," mentioned in the first paragraph.

Response: The “core reach” refers to the section of the Chehalis between the confluences with the Newuakum and Skookuchuck rivers mentioned in the previous sentence.

Page 169. Section 4.1.3.2. Long-term Effects: The DEIS states that the preferred alternative will have “relatively little effect on the active floodplain,” that it will “generally function” similar to existing conditions, and that the extent of flooding would be only “slightly modified.” Given the level of concern raised about these questions, we recommend the Corps quantify the area that would be flooded under various flooding events as compared to existing conditions. It would also be helpful to quantify the area that currently floods that is covered by impervious surfaces.

Response: The most notable change to flooding within the Chehalis River valley under the preferred alternative would be a reduction in flooding in the mostly urban areas along the east side of I-5. It is estimated that the preferred alternative would eliminate flooding over an area of roughly 2,500 acres in the vicinity of Chehalis and Centralia during a 100-year flood event. Most of this area is highly urbanized land located on the east side of I-5. A large percentage of this area is covered by impervious surfaces (i.e., roads, parking lots, buildings, etc.). Additionally, most of the areas on the east side of I-5 that have historically flooded from the Chehalis River have generally functioned mostly as backwater storage areas during flood events and have had very limited function in terms of providing downstream conveyance of flood flows. Because most of the active floodplain will be unaltered by the project, use of set back levees to eliminate flooding in the mostly urban areas outside of the active floodplain will have only a slight impact (generally several inches or less) on flood stages within the active floodplain. Furthermore, operation of the Skookumchuck reservoir for flood control purposes will provide up to 20,000 acre-feet of flood storage that will offset the loss of flood storage attributable to the proposed levees and will hence offset any downstream peak water surface increases attributable to the proposed levees. The net result of the effects of all components of the project will actually be a net increase in flood storage resulting in a slight reduction in peak water levels in the Chehalis River downstream of Centralia during flood events.

Page 171: Virtually eliminating overbank flooding could have much more serious environmental consequences than implied here (please see the CAR page 22-24 and 54-55). The CAR recommends geomorphology and sediment studies to help quantify impacts so that an appropriate level of mitigation may be developed. Apparently these studies would have been difficult, if not impossible to accomplish, given the goal of obtaining Water Resources Development Act (WRDA) 2002 funding. We now understand that WRDA 2002 funding may no longer be a reasonable goal, and we urge the Corps to begin scoping these studies as soon as possible. If these studies are not done to provide greater certainty about the potential impacts, then our support for the dam modification will depend upon a much higher level of mitigation and restoration in the Skookumchuck sub-basin to cover those uncertainties. With or without the studies, an appropriate mitigation and monitoring plan should be developed in coordination with the resource agencies and tribes, for potential impacts to channel processes, in-channel habitat, wetlands, and loss of riparian or wetland function due to alteration of flows.

Response: The Corps is still on schedule to complete this study for a WRDA 2002 authorization. The Corps is planning to conduct additional studies during design to assist in finalizing the re-

operation plan for Skookumchuck Dam. This additional work as with the design of the project will be coordinated with the resource agencies and tribes to ensure that all impacts are minimized to the maximum extent practical.

Page 174. Section 4.2.3: The discussion refers to "rapid" ramping rates (i.e., 95 cfs up to 3,000 cfs) as the dam is operated for flood reduction. We are assuming that the actual rates are consistent with the fishery agreement and are not exceeding the rates presented in Appendix A of the DEIS. Please clarify in the Final EIS whether this is the case and how ramping rates protective of fisheries would be handled during flood season.

Response: *All ramping rates will be based on fisheries requirements except in a catastrophic event.*

Page 175. Section 4.2.4. Summary: The summary states there will be "no net loss in flushing flows or increase in flood duration" from revised operation of the Skookumchuck Dam. These conclusions don't appear to be supported by the discussion in the DEIS. As discussed in the CAR, page 54-55, a sediment effectiveness analysis, or similar study, would be valuable in determining the flows at which channel maintenance occurs presently in this system. A conclusion regarding the degree to which channel maintenance would be affected by the flow characteristics resulting from the proposed alternative would be much more supportable with that information at hand.

Response: *Flow operations from Skookumchuck Dam during non-flood events will be similar to the operation that is in place today. Except for flood events, post-project outflows should continue to follow historic outflows as recorded by the Bloody Run gage located slightly downstream of the dam (Table 1). In the absence of a flood, Skookumchuck Dam is expected to operate for the benefit of both PacifiCorp and the natural resources of the River (see Table 2). However in the existing operations guidance, not all areas of routine operation are clearly described. For instance, there is little discussion of proper ramping rates. The WDFW/PacifiCorp agreement of May 1998 simply states: "Flow reductions under this Agreement shall be accomplished in a manner that minimizes the stranding of juvenile fish". Specific criteria were not provided initially because the bypass reach between the dam and its hydropower unit was so short and no other opportunities to significantly modify flows existed at the dam. With the installation of flood control capability however, large changes in river stage will become possible.*

The Bloody Run gage shows wide flow variations through the years. In general, daily discharge trends show flow increasing from a low of about 100 cfs in the late summer (August) to a mean monthly flow in January and February around or exceeding 1,000 cfs. This pattern can vary widely by year although the summer month regimes are quite consistent.

Page 217. Section 4.8.3.1. Centralia Area. Paragraph 2: Our understanding is that levees will not be placed anywhere west of the Chehalis River. This paragraph contradicts that understanding. Please explain if this is a new design feature or delete, if this is an error. This element is not shown on the map of levee alignments and should be indicated there.

Response: *Your understanding is correct. This was a typographical error that will be corrected. The sentence should read: "Levees would be placed west of I-5 in low-density residential lands..."*

Page 257. Section 6.1.5. Fish and Wildlife Coordination Act: Please clarify that the FWS sent you a draft CAR. Section 2(b) of the Fish and Wildlife Coordination Act is not fulfilled until the final CAR is received.

Response: *Changed to read as above.*

Thank you for the opportunity to comment on this document. We look forward to working closely with your agency and providing you with the best possible recommendations and analyses required to complete the final document. For information or questions, please contact Lou Ellyn Jones at (360) 753-5822 or Lynn Childers at (360) 753-5831, at our Western Washington Fish and Wildlife Office in Lacey, Washington.

<signed>
Preston Sleeper
Regional Environmental Officer

Comment 14:
Curtis Du Puis
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Centralia, WA 98531-0184
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Email: curtisdupuis80@hotmail.com

Executive Summary Page V, ...For levee alignments ...at Ground Mound the peak flood stage would decrease 0.2 foot. Between Grand Mound and Porter, the peak flood stage decrease would vary from as much as 0.39 foot to as little as 0.06 foot.

At the Grand Mound flood gauge, using the 1996 flood data, please compare the volume of floodwater passing through the gauge before and after the levee alignment project.

Is the total volume of floodwater after the levee alignment equal, less than or greater than the total floodwater volume of 1996?

Please chart the timeline and floodwater volume comparing the 1996 flood as it occurred compared to the impact of the proposed levee alignment.

Your assumptions can include the following:

Only the levee alignment has occurred; and

That the Skookumchuck improvements and the levee alignment has occurred

Response: *The overall volume of floodwater passing this gage during a specific flood event would be the same for both pre-project and post-project conditions. Based on the combined effects of all components of the project, the preferred alternative would cause a shift in the timing of the flood event by slightly reducing the peak of the flood event at the Grand Mound gage and slightly increasing flows at Grand Mound during the falling limb of the hydrograph (i.e., period of hydrograph recession). Most of this shift is attributable to the use of the Skookumchuck reservoir for temporary flood storage. Because floodwater would be released from the reservoir following the downstream flood peak, the overall volume of the flood hydrograph would be unchanged. This temporal shift in the hydrograph would also occur during a flood event similar to the February 1996 flood.*

After the floodwater passes through the Grand Mound flood gauge, where do you anticipate the floodwater will pond?

Will this project result in a longer duration of flooding and a higher level of flooding in the ponding area?

Response: *As noted in the previous response, the proposed project will have little impact to flooding along the Chehalis River downstream of Centralia other than a relatively minor temporal shift in the flood hydrograph. The temporal shift will cause a slight reduction in the downstream flood peak and a slight increase in the falling limb of the hydrograph. Downstream increases in the falling limb of the hydrograph, which would be attributable to the release of stored floodwater in the Skookumchuck reservoir, would be made such that any natural downstream flooding is not worsened. As a result, the spatial extent of flooding downstream of Grand Mound should be virtually unchanged by the proposed project. Specifically, the project would likely result in a slightly lower level of flooding along the Chehalis River downstream of Centralia (i.e., a lowering of the peak flood stage on the order of about a tenth of a foot). Release of stored floodwater in the Skookumchuck reservoir following the flood peak may cause a slightly higher duration of near bank-full conditions in the Chehalis River downstream of Centralia but should not increase the duration of downstream flooding.*

If the Chehalis Indian Reservation flood ponding area is flooded earlier (perhaps closing the reservation access roads) or at a higher level (causing damage to existing structures) because of the levee alignment:

How does the Corps propose to mitigate the impact?

Do you have a statutory obligation to mitigate the impact?

Response: *The preferred alternative, which includes multiple features (new levees, SR-6 bypass feature, improved flood control at Skookumchuck reservoir), will not cause areas in the vicinity of the Chehalis tribal lands to flood earlier or flood at a higher level relative to existing (pre-project) conditions.*

Introduction, page 1: Figure 1.1 (page 2) shows the inundation within the project area during the 100-year flood:

What year is the date of the flood map?

Response: *This figure is based on a hypothetical 100-year flood event in the Chehalis River, which was derived based on a statistical analysis of multiple stream flow records collected in the Chehalis River basin. It should be noted that the hypothetical flood event was calibrated to a 70-year record of stream flow data collected in the Chehalis River at Grand Mound. A recent statistical analysis of these data suggests that the 100-year peak discharge in the Chehalis River at Grand Mound is about 74,500 cfs. The peak of the hypothetical 100-year flood is also about 74,500 cfs.*

Introduction. page 5, 1.4 Study Area. After the floodwater leave the Centralia -Chehalis area, the water seems to pond within and near the boundaries of the Chehalis Indian Reservation.

Why do you not include the Chehalis Indian Reservation in the Study Area?

Response: *The Chehalis Indian Reservation is not within the scope of the project.*

Alternative 3. Page 25, Centralia Overbank Excavation: This would involve excavation of approximately 2.4 million cubic yards of material...

Where will this fill be deposited?

Response: *Overbank excavation will not be part of the project.*

Alternative 7 -Interagency Committee Alternative: Measure 1 -Moratorium on Floodplain Development (page 36). In the interim, a moratorium on floodplain development would be implemented...

Within the existing FEMA (1992?) floodplain map, Lewis County, the cities of Centralia and Chehalis have never ceased development in the floodplain; how do you proposed these entities t will implement a moratorium of development in the newly designated floodplain?

Response: *In order to implement the Corps project following authorization, the local sponsor must commit to a post-project floodplain management plan that is in compliance with NFIP and federal regulations regarding development in the floodplain. If Alternative 7 were to be carried forward as the preferred alternative, a temporary moratorium would be a part of the new management plan. (However, it should be noted that NFIP does not require such a moratorium to be in placed until new floodplain maps are adopted.) A moratorium could be adopted through legislative action of the city councils and county commissions.*

2 Preferred Alternative. 2.5.1 Setback levees, page 48: ...Large areas of the floodplain that are not developed would not be protected, so construction of the levee system would not encourage new floodplain development.

In spite of the existing FEMA floodplain (1992?) map, K-Mart, Wal-Mart, new Centralia waste treatment plant, and the Chehalis Burger King are all located in the floodplain, so how will this statement be honored by Lewis County and the cities of Centralia and Chehalis?

Response: *In order to implement the Corps project following authorization, the local sponsor must commit to a post-project floodplain management plan that is in compliance with NFIP and Executive Order 11988. Executive Order 11988 is intended to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It should be noted that the Corps' study team conducted a thorough review of county and city floodplain regulations and their enforcement and found that all local jurisdictions are in compliance with federal NFIP and state floodplain regulations.*

2.5.3 Non-Structural Features. Define a new 100-year FEMA Floodplain: A new 100-year floodplain map will be generated... The communities will adopt this map.

Is there a projected date for this map to be adopted?

<signed>

Response: *There is no specific projected date for adoption of a new 100-year FEMA floodplain map. FEMA is planning on starting the process for remapping prior to the construction of the project and then undertaking additional mapping when construction of the project begins. In addition, Lewis County and the other local jurisdictions are committed to using the best available information in the administration of local floodplain development ordinances, and the hydraulic modeling completed in the course of this project may allow Lewis County to become a Cooperating Technical Partner with FEMA. This could facilitate reconciliation of FEMA flood maps with "best available" flood information for the existing condition and would allow the local jurisdictions to begin using the new information in regulating land uses in the area. It would also set the stage for adoption of new FEMA flood maps in digital format.*

Comment 15:

R.C. Jacobson
7300 Prather Rd. SW
Centralia, WA, 98531

Since the enclosed "Study Area Location" map indicates my ranch along the west side of the Chehalis River is within the study area I am vitally concerned about the risks of the preferred alternative.

In 1989 the Thurston County Engineering Dept. eliminated a 360-foot floodway adjacent to the Prather Road bridge reconstruction and replaced the floodway with 2 8ft culverts. These culverts did not carry the overflow volume or the 1990 flood and the road embankment was sanctioned by a change in the F.E.M.A. floodway map in response to the Thurston County Engineers Request.

The road embankment was constructed in Jan 1990 as originally designed and was again washed into the downstream field during the 1996 flood. The road embankment was again reconstructed with the addition of Gabon's on each side.

The Thurston County Engineer was advised by me and others that 2 8-foot culverts were inadequate, prior to construction in 1988, to replace a 360-foot floodway bridge to no avail.

The subsequent damage to my ranch and the riverbank on the west side of the river down stream was severe. These effects were caused by a change in the flow of water beneath the bridge resulting in flood whirlpools traveling downstream along the banks of the river and under-mining the bank and trees. This seriously reduced shading and fish habitat for about 3,000 feet of the west bank in addition to the removal of about 2 acres of farmland.

The Prather Road bridge is presently a stream flow restrictor similar to the Mellon Street bridge in Centralia. These restrictors are dramatically illustrated by the WSDOT aerial photos of the 1990 and 1996 floods.

The preferred alternative appears to satisfy criteria 1 and 2, which suffer the major financial impact during a major flood event. However, it appears by logical deduction that a restriction of the flood storage area in the Centralia and Chehalis cities will raise the elevation of floodwaters and therefore the velocity of the floodwaters in downstream Chehalis River areas. While the Skookumchuck Dam modifications will reduce the volume of floodwater from that watershed, a significant part of that basin is downstream of the dam and rainfall in this area will not be restrained.

Page 170 of the Draft E.I.S., in the second paragraph, my conclusions are supported by the statement "The peak flood stage would increase between RM 70.74 and 78." However, a following statement "The 100-year peak flood stage would decrease by 0.18 foot at the Galvin Road bridge and by 0.24 foot at Grand Mound," has no supporting evidence and defies logic. Other statements say a study of this effect was made but no supporting data was indicated.

Response: *The text on Page 170 of the Draft EIS that characterizes the reach of the Chehalis River that would experience slightly higher flood stages as a result of the preferred alternative is unfortunately in error. The increases in the peak Chehalis River stage as a result of the preferred alternative would be limited to the reach between roughly RM (river mile) 70.9 to 74.1. Furthermore, the maximum increase in peak flood stage during a 100-year flood event would be about 0.5 foot (not 0.61 foot as stated in the DEIS) near RM 72.8.*

The issue of potential impacts of the preferred alternative to reaches of the Chehalis River downstream of the project area (i.e., downstream of Centralia) has been studied extensively. In particular, the hydraulic model used to evaluate the Chehalis River in the vicinity of the project area was extended to reaches of the river downstream of Centralia to evaluate potential downstream impacts. While it is true that the addition of levees along the Chehalis River has the potential to cause slight (i.e., up to 0.5 foot) increases in peak water levels in the Chehalis River along a limited reach upstream of Centralia during large flood events, any potential effects of the levees on peak water levels downstream of Centralia will be offset by proposed flood control

operations at Skookumchuck Dam. In particular, modifications to Skookumchuck Dam proposed as part of the preferred alternative will allow the Skookumchuck reservoir to be operated for flood control purposes. As a result, reduced flows in the lower Skookumchuck River as a result of flood control operations at the reservoir will offset any flow increases in the Chehalis River downstream of Centralia that are attributable to the proposed levees. The net result of the effects of all components of the preferred alternative will actually be a slight reduction in peak water levels in the Chehalis River downstream of Centralia during flood events.

Having observed the flood events over the past 28 years at the Grand Mound Gaging Station, which is situated on my ranch, I am concerned about increased velocity and elevation of these flood events, which cause damage to my ranch and many other downstream properties. These increased velocity and elevation floods have indicated that the Chehalis River will probably change course and relocate its streambed. Such a course change will have devastating consequences to private and public property downstream without additional solutions and modifications to the present river channel.

One modification is the re-establishment of the floodway east of the Prather Road bridge.

Other comments are:

1. The SR-6 floodwater storage area of 170+ acres appears inadequate to compensate for the reduced floodwater storage area around Chehalis and Centralia.

Response: *The purpose of this site is first to provide habitat mitigation. This feature also reduces water levels in the Chehalis area.*

2. Notwithstanding the comments on pages 171 and 172 concerning hydraulic modeling and bank erosion, I disagree based on 28 years of observations.

<signed>
<graphic attached>

Comment 16:

Dale R. Rancour
Thurston County Engineer
2404-A Heritage Ct. SW
Olympia, WA 98502

Due to the short time for review of this document, I have not had the opportunity to coordinate this response with my colleagues in Thurston County. The following is my response as Thurston County Engineer of Roads and Transportation Services based primarily on past comments by Thurston County officials.

I support the need to study the reduction of flood hazards to the cities of Centralia and Chehalis and the adjacent urban area; and to improve fish and wildlife habitat where possible and

appropriate. I have great concerns and a great need to be an active participant because of the possible project elements and impacts in our county.

My following comments are based on the public information meeting held on January 27, 1999 in the Town of Bucoda, and the attached letter dated February 4, 1999 from the Town of Bucoda.

While flooding is a major concern of the town and the county, so is erosion. While the town has taken steps to elevate buildings to address flooding concerns, I still have concerns that the Skookumchuck Dam flood control plan may result in longer and more frequent river flows filling the main channel and increasing bank erosion. The floods of 1990 and 1996 caused considerable riverbank erosion, which left the banks sensitive to higher flows.

Response: *The flood control plan will not increase the frequency of bank-full flows downstream of the dam (this includes the reach at Bucoda). One of the primary goals of the proposed Skookumchuck Dam flood control plan will be to limit damaging (i.e., damaging to property and infrastructure) flood events downstream of the dam. The project will therefore be operated to limit channel overtopping events in critical areas when feasible. For instance, during smaller flood events that currently cause some channel overtopping and damage, the Skookumchuck Dam would likely provide sufficient flood protection to prevent damaging flooding along the downstream Skookumchuck River. In this scenario flows may reach bank-full conditions but wouldn't exceed bank-full conditions in critical reaches vulnerable to flood damage. During larger flood events, the Skookumchuck Dam would reduce downstream peak flows relative to current conditions but may not be able to eliminate downstream flooding (in this scenario there may be sufficient unregulated runoff entering the Skookumchuck River downstream of the dam to cause flooding). As a result, downstream reaches may still flood during large flood events but the extent of flooding (spatial extent and depth) would be less relative to current conditions. In summary, the flood control plan would likely result in a similar frequency of bank-full events along the Skookumchuck River relative to current conditions. The flood control plan would result in a lower frequency of damaging, channel over-topping events relative to current conditions.*

Except for vague statements such as the following on page 15, the report does not address erosion concerns: "Sediment sampling and analysis was performed to evaluate the impact of alternative projects on the sediment regime and to develop potential project operation and maintenance costs. A probabilistic risk and uncertainty analysis was performed for the selected project to help determine the recommended plan."

In answer to questions from the resource agencies, about channel stability of the Skookumchuck River, the report (on page 103) acknowledges that additional evaluation of the alternative 2404-An impact on environmental resources would be needed. Will this evaluation address the concerns of the Town of Bucoda? Does the reference to "downstream environmental requirements related to reservoir operation and flood control regulation will continue to be a part of the operation plan" on page 149, mean that the river channel stability costs will be paid by the local agencies? If so, I don't agree.

Response: *The reference on page 103 documented initial screening of the alternatives; further evaluation of the alternatives impact was conducted and is documented in the EIS. This will be*

further clarified in the final GRR. As far as the Town of Bucoda's concerns, they will be further evaluated during the design and finalization of the dam re-operation plan. Referencing page 149, this discussion was describing the current summer low flow environmental requirements and not any addition channel stability requirements.

In addition to erosion concerns regarding the dam modifications, here are some other comments:

1. Skookumchuck Dam stability evaluation. It is my understanding that the current owner is responsible for remediation of existing safety needs. Assuming these repairs are made, will the dam be suitable for the proposed flood flow modifications?

Response: *Yes, if the dam stability remediation is completed, the dam will be suitable for the flood control modifications.*

2. What are the environmental impacts and mitigation for raising the dam reservoir? The only project environmental mitigation features I have found in the report are on page 149 in the vicinity of State Route 6 and the Scheuber Drainage Ditch. Are these intended mitigations for the dam modifications? Are these sufficient mitigations?

Response: *Based on the current configuration of the dam the typical maximum annual reservoir elevation is about 477 feet. This elevation is largely controlled by the current crest elevation of the spillway (spillway crest elev. is 477 feet). Because the current spillway does not have control gates, discharge through the spillway is essentially uncontrolled. This means that once the reservoir fills in the fall and reaches the spillway crest inflows into the reservoir are generally passed with little attenuation over the spillway and into the downstream reach of the river. As a result, the reservoir elevation is generally maintained at a constant elevation of roughly 477 feet during most of the typical flood season (i.e., late October through March).*

The proposed flood control project will include modifications to Skookumchuck Dam to better utilize the reservoir for flood control purposes. Modifications mostly consist of adding a gated outlet tunnel to allow better control of reservoir discharges and modifying the current spillway to allow storage in the reservoir to a maximum elevation of 492 feet when needed. From an operational sense the biggest change in reservoir operations will be a lowering of the reservoir at the onset of the flood season to about elevation 455 feet to create available storage space in the reservoir in the event of a flood. Under most circumstances the reservoir will be maintained at an elevation of about 455 feet throughout the flood season. The reservoir will typically exceed elevation 455 feet only during flood control operations when the reservoir is used to store high inflows. The maximum pool elevation reached during a flood control operation will be dependent on the flood event. During most flood events water would be stored to a maximum elevation of about 477 feet or less. Only during very large (and infrequent) flood events would the maximum reservoir elevation exceed 477 feet. Only under very rare and extreme floods would the reservoir reach an elevation of 492 feet. Furthermore, it is important to note that most flood control operations only last several days. As such, water stored in the reservoir above elevation 455 feet would be evacuated from the reservoir as soon as the downstream flood threat is diminished. As a result, the flood control project would result in a lower reservoir elevation during the flood season relative to current operations under most conditions. In other words,

while the current operation results in a typical reservoir elevation of 477 feet between November and March, the proposed operation would result in a typical reservoir elevation of 455 feet during this period. The proposed plan would result in only infrequent reservoir elevations greater than 455 feet, with elevations greater than 477 feet occurring rarely. This proposed operation actually results in a decreased downstream dam-break risk since the typical flood season reservoir contents will be less relative to current operations.

Regarding the possibility of a dam-failure flood entering the Scatter Creek basin, please note that the current operator of the project (PacifiCorp) is required by FERC to maintain an Emergency Action Plan (EAP) for this project. One of the primary functions of an EAP is to address potential dam failure scenarios and provide inundation mapping for a catastrophic dam failure scenario. Please refer to the inundation mapping in PacifiCorp's EAP for the Skookumchuck Dam as this should show whether a dam-break flood has the potential to enter the Scatter Creek basin.

The mitigation at present is sufficient for the proposed project. If future studies indicate additional mitigation is required that area will be addressed at that time.

3. Is there an increased need for more emergency warning systems with the raising of the dam?

Response: *The dam will not be raised. Modifications to the dam do not include raising the structure, but allowing for additional storage in the reservoir. Additional emergency warning system is not deemed necessary.*

4. What are the impacts of wider flows from a potential dam failure? Would these flows spread to the Scatter Creek Basin?

The report is unclear on the project impacts downstream of Centralia for the selected plan. Do the levee and Skookumchuck Dam modifications discussed on page 94 relate to the selected plan? Relative to downstream of Centralia, would levels likely be lower relative to the peak stages under existing conditions? Is this for all flood events? Some of this area floods under relatively minor flood events.

Response: *The proposed project would not lead to increased flood stages along the Chehalis River downstream of Centralia. Hydraulic modeling indicates that the combined effect of all components of the project will lead to a slight reduction (on the order of several tenths of a foot) in the peak flood stage in the Chehalis River downstream of Centralia relative to existing (pre-project) conditions.*

Are there any adverse maintenance and operations for the selected plan due to sediment or erosion downstream of Centralia? On page 15 it is noted that a sediment sampling and analysis was performed.

Response: *The sediment study referred to on page 15 of the DGRR is referring to a study conducted on the Chehalis River. This study showed that the selected plan would have little to no impact on addition erosion or sediment transport.*

I will refer Institutional Studies on page 18 to our legal staff. It is my understanding that Thurston County still has authority over anything that impacts them financially or regulatory. If my understanding is correct, "Thurston County Regulations" needs to be added under the column "Law/Regulations/Treaty" of Table 6-4, Status of Compliance With Environmental Laws/Regulation/Treaties on page 169.

Response: *This will be corrected in the FGRR*

I am unclear on the selected plan impacts to Coffee Creek. This is a flat gradient creek from its outlet to the Skookumchuck River, which is also close to the Chehalis River.

Response: *There is some backwater effect into Coffee Creek; for this reason the plan does have levee wall protection. There is no additional protection from flooding resulting from Coffee Creek.*

If the Corps develops a monitoring and adaptive management plan as recommended by some of the services, these costs should be part of the overall construction project and not passed on to the local agencies.

Response: *The operation and maintenance costs are a part of the overall project costs, but these costs are the responsibility of the local sponsor.*

Thurston County Development Services Department will want to participate in any mitigation plans relative to impacts in Thurston County. These mitigation plans need to be part of the construction project.

Response: *The Corps will continue to coordinate with Thurston County during the design of the project.*

Thanks for the work and opportunity to review. If you have any questions, please feel free to call me at (360) 786-5134.

<signed>

Dale R. Rancour, PE
County Engineer

ORAL COMMENTS FROM AUG 22, 2002 PUBLIC MEETING¹

MR. CARNS: Summary: Mr. Carns, on behalf of State Senator Zarelli, made a comment expressing his interest in finding solutions to the flooding problems in Lewis County.

***Response:** We appreciate State Senator Zarelli's interest in this project.*

MR. LOTTO: Good evening, Corps representatives. My name is Bill Lotto with the Lewis County Economic Development Council. We are not surprisingly vitally interested in this project and seeing progress made on this project. I think for decades and decades the emphasis has been far too heavily on process, not product. I think we're moving quickly to the point where we would really need and want to see product or outcomes.

Two things that we would really encourage you to go back and take a serious look at that I think that the Economic Development Council thinks are probably missing today, and that is all of the discussion in support for widening the Mellen Street to expand the floodway improvements through that area; and, second, to ensure that we go with the maximum possible, highest possible level in regards to the Skookumchuck Dam improvement.

***Response:** Skookumchuck Dam at 20,000 acre-feet storage capacity is a part of the recommended locally preferred plan. The Corps evaluated the widening near Mellon St. to create a bypass. During the evaluation process this alternative was found to be economically unjustified for cost-sharing by the Federal government, and is not part of the plan recommended to Congress. In addition, several environmental issues regarding this action could not be addressed during the study.*

MR. CAMPBELL: My name is Dave Campbell. I'm with the City of Chehalis, the position of City Manager.

We are pleased with the proposed project as far as it goes right now. We've been a partner with Lewis County, Lewis County being the local lead agency or local sponsor for this project, and we want to continue in that role of partnering with the County and plan to as this project hopefully does go forward.

We would like to see more consideration given to the higher dam alternative, or the Skookumchuck. We believe that is important, not so much for the local area, but for more benefit downstream, and there have been agencies and others downstream that have been supportive of this project, and we'd like to see their needs and concerns addressed. And also the Mellen Street bypass in the vicinity of the Mellen Street bridge is certainly important to the city of Chehalis, as

¹ Some comments have been edited to include main points. Several comments were also submitted as formal written comments, which are presented earlier in this chapter.

it affects upstream reduction of flooding levels. So those two aspects of the project are something that we'd like to see continued as available for further study and consideration; we think they're important.

Response: *Skookumchuck Dam at 20,000 acre-feet storage capacity is a part of the recommended locally preferred plan. The Corps evaluated the widening near Mellon St. to create a bypass. During the evaluation process this alternative was found to be economically unjustified for cost-sharing by the Federal government, and is not part of the plan recommended to Congress. In addition, several environmental issues regarding this action could not be addressed during the study.*

MR. HUBBERT: My name is Buck Hubbert. I'm president of Tires, Inc., in Chehalis and also I'm on the Industrial Commission. I was on the original Flood Action Council in 1996. Our business on State Street exit at 79 had six feet of water in the 1990 flood, and we had nine feet in the total corporation in the retread plants in '96. We can't stand anymore of this. Our business suffers gravely by it, everything we're involved with in the area; if we don't do something here, we're going to just go out of business.

The flood project as it's written looks promising. The reduction project looks like it will work. If it worked for the best interests of anybody, then you believe it will have the less impact. There are other problems in the area that we need to address, but we think that the thing that should be added was, again, like what Bill Lotto and Dave said, is that the Skookumchuck should be to the maximum height in case of the worst events we could have.

And the other thing is Mellen Street, to keep the water from backing up on us in this area and further south. If we could get that done, we just think this would be great, and we'd like to get started on it. All the meetings, all the people I meet with, the only thing that's going to happen is to get it going, and some of the good things will happen to the area. And we will have the money from our budgets for more business.

Response: *The proposed plan does included 20,000 acre feet of storage for the Skookumchuck dam. As addressed in comments by Mr. Lotto and Mr. Campbell, the Corps evaluated the widening near Mellon St. to create a bypass, but found it to be economically unjustified and raised too many environmental issues.*

MR. GREEN: My name is Judy Green. I'm also a resident of the Newaukum River. Our farm has been flooded in '91 and '96, and my question is to the Army Corps of Engineers. Has there been a study on what impact the changes made on the Chehalis River will have on the backup and flooding of the Newaukum River? Have the hundreds of thousands of yards of fill put in the last five years at Exit 72 area been included in any such studies? And that is including today because there have been hundreds of thousands of yards put in on the west side of the freeway this past year.

Did your new floodplain map also mention that Exit 72 was closed in '91 and '96?

Response: *See written comments section. The comment by Ms. Spencer pertains to this.*

MS. FIELDS: My name is Gusty Fields, and I've been living in North Centralia and living in this area on and off since 1971.

Ever since we've ever been in North Centralia, whenever there's been any type of flooding, we have always been landlocked one way or the other, so even though the water hasn't impacted our own land or house, we couldn't get out, and neither could our neighbors, and I am seriously concerned about the landfill problems the last gentleman spoke of, too, because it seems like it hasn't helped.

So whatever comes up and whatever you all do about it, keep that in mind that the north end usually suffers water and usually up by Carson. I'm also concerned about what happens in China Creek because that seems to impact the downtown area. So think about this before you all do it.

***Response:** We appreciate your comments and will consider them through our process.*

MS. POWE: Julie Powe. I have several comments. I haven't been involved in this as long as some people, but over the last couple of years, we did some serious consideration on this. I really have to say in the end I do not feel that the dike system is the right system.

I also disagree with the wetland. There's talk about taking a section of wetland out, but they're replacing it with wetland along the Highway 6. I disagree with it also, where the wetlands are right now is wetland, always been wetland. The only thing taking that wetland's benefit would be some more large businesses moving in and filling it up and building something. They're taking prime farmland out of circulation by putting the wetland right in the center of it.

And I also wanted to agree about the fill. The fill is -- I still see filling in the storm area, and, again, that has to stop. We need to fix it from the bottom up, and the dike here is not the answer.

***Response:** We would also like to state that wetlands have immense environmental benefits, as well as improving the flood capacity. See response to Mr. Campbell's comment about the Mellon St. bypass earlier in this section.*

MR. CALKINS: I'm Terry Calkins. I'm the Community Development Director of the City of Centralia. Centralia also suffers with substantial flooding problems in her downtown area on China Creek. We've talked extensively about the issue with the Corps. They're all part alternatives for flood control and have been identified and would like to encourage the Corps, if there is a federal interest, to continue participating with the China Creek Project and address the environmental issues at an appropriate time.

I don't see much -- I have yet to find references to China Creek in the Environmental Impact Statement. If they're not there, I would like those added to the document to make sure that there is the appropriate references. Centralia, again, concurred with the Flood Project Executive Committee that the preferred alternative for our community was a conveyance way alternative, which is a combination of alternative 2 and 3. We understand why the Corps has chosen the levee alternatives, but we do believe that some portions of the conveyance way alternative

should be implemented, including the Mellen Street bypass alternative in conjunction with the reservoir alternative.

Response: China Creek discussion is included in the GRR document and will be looked at further to determine federal interest in finding a remedy for the flooding caused by China Creek. The Mellon St. bypass is not recommended on account of the environmental impact and the lack of economic support.

EPA'S DETAILED COMMENTS TO THE CORPS

The objective of this flood damage reduction project is to reduce flooding along the mainstem of the Chehalis and major tributaries (the Skookumchuck and Newaukum rivers) within the vicinity of the cities of Chehalis and Centralia with the goal to protect flood prone areas and to incorporate appropriate fish and wildlife habitat restoration and protection.

Purpose and Need Statement Additions

Unified Federal Policy (UFP) and Environmental Sustainability

The Purpose and Need Statement's (Statement) goals and objectives should incorporate the UFP and environmental sustainability. We recommend that the goals and objectives describe other issues that need to be resolved as part of a successful solution to problems occurring within the project area. Issues that will be addressed by the Flood Damage Reduction Project (Project) should go beyond reducing flood hazard and improving habitat issues identified in the Project purpose. The goals and objectives of the Project should support sustainability at the watershed level.

As a fellow federal signatory to the UFP, we recommend that the Corps address and integrate the goals and objectives of the UFP into the Final Environmental Impact Statement (FEIS). Along with six other federal agencies, both the Corps and EPA signed in 2000 the UFP on Watershed Management. The UFP has two goals: "(1) Use a watershed approach to prevent and reduce pollution of surface and groundwaters resulting from Federal land and resource management activities; and (2) Accomplish this in a unified and cost-effective manner."

Since the UFP addresses adaptive management, best management practices, and a watershed approach, it can be used as a model for managing resources at a broad sub-basin scale. The proposed floodplain project area encompasses a critical sub-basin within the Chehalis watershed, namely, the middle segments of the Chehalis system's floodplain and tributaries along the mainstem from RM 88.3 downstream to RM 60.0 near Grand Mound. In light of the prevalence of impaired water bodies in the project area due to water quality pollution (primary parameters being temperature, fecal coliform, and sediment), we suggest that the Corps consider this project area from a sub-basin perspective to improve prescriptive elements within the FEIS to address Clean Water Act concerns.

In memorandums and discussions during 2001 and 2002 between EPA's Office of Federal Activities and the Corps's Office of Wetlands, both agencies have acknowledged the importance of interagency support and collaboration on environmental sustainability for civil works projects which focuses on maintaining "a healthy, diverse and sustainable condition to life" (memorandum of June 2002). We acknowledge the Corps' positive planning efforts since the proposed Centralia Flood Damage Reduction Project will support ecosystem restoration projects. These efforts are in the spirit and direction of the memorandum. However, in reviewing the

DEIS, efforts to address environmental sustainability are not apparent and need to be more clearly stated. EPA further encourages the Corps to disclose in the FEIS action elements that will restore riparian and floodplain functions and processes and reduce water pollution issues within the project area, such as non-structural floodplain modifications.

Response: *The Corps is already using the goals and objectives of the UFP. Although the exact wordage UFP is not mentioned in the DEIS the goals and objectives are being met throughout this proposed project. The Corps is and will continue to use consistent and scientific approaches to manage the federal lands and resources to assess, protect and restore wetlands within the project area. In good faith to the guidelines of the UFP a working group was formed from tribal, federal, state, and local governments to develop restoration sites and provide input on the preferred alternative decision process. To ensure that UFP objectives are met during the construction of the proposed project, UFP wordage will be added to the FEIS. For individuals that are not familiar with UFP it must be explained that UFP is a policy and not a rule.*

The preferred alternative includes a conceptual-level description of habitat restoration actions. This includes identification of potential restoration sites and a description of the types of actions that would be taken at the sites. The Corps believes this level of detail is appropriate for EIS at this stage of the project. However, additional information can be found in the Draft Restoration Report, which is available from the Corps upon request. The Draft Restoration Report includes site rankings, acreage, and habitat outputs for each of the potential restoration sites. Additional detail will be developed during the project design phase. That work will include additional investigation of existing site conditions, final identification of sites to be restored, and development of construction plans and specifications for each restoration site.

The Corps of Engineers will employ adaptive management techniques to the SR-6/Scheuber Ditch mitigation site. This will consist of a monitoring plan being developed and a monitoring at years 1, 3, 5, 7, 10. The vegetation will be measured at a 80 percent success and at the same time a survey of wildlife use will occur. The ditch will be monitored for fish usage during these monitoring events. At anytime during or if notified that the project is not meeting expectations, adaptive management will occur.

Restoring Floodplain Functions of the Chehalis River and Tributaries

The Purpose and Need Statement of the FEIS should disclose the importance of not only restoring stream habitat functions but also of restoring floodplain [hydrologic] functions of the Chehalis River and its tributaries within the project area to effectively address and manage a wider range of flow events.

In the DEIS, the purpose of the proposed project is to reduce flood hazards to the study area and to incorporate appropriate fish and wildlife habitat improvements. Major needs of the flood project are to reduce depressing economic effects due to the damages and uncertainty associated with future floods and to improve degraded areas along the Chehalis River or its tributaries so as to sustain and improve existing fish and wildlife resources in the Chehalis Basin. As written, there exists a disconnect between the DEIS purpose and need statement and the proposed range of alternatives. While the proposed range of alternatives includes both structural alternatives

(e.g., overbank excavation and flowway bypass, levee system improvements, and dam modifications) and non-structural alternatives (e.g., upstream flow restrictors and upstream storage enhancement), this intent or direction is not reflected in the statement.

Response: *Thank you for your views on the DEIS. Alternatives do not or are not required to meet the purpose and need statements to be considered during the evaluation process. That is why all alternatives considered are part of the DEIS and the FEIS. The importance of restoring floodplain functions is stated near the end of the purpose and need statement in the DEIS.*

Range of Alternatives -Existing and Proposed

Alternative 1 -No Action

The DEIS does not state if the cost benefit analysis of the no action alternative includes the elevation and widening of Interstate 5 (I-5). The DEIS states (No Action, page 22) that "Under the no action alternative, flood damage would continue to cost the local economy an estimate of \$9,122,060 annually..." The FEIS should disclose if the projected annual costs of continued flooding to the local economy includes the current WSDOT proposal to elevate I-5 above the 50 year floodplain, which likely would occur under the no action alternative. This proposal is currently being considered to solve some of the flooding problems of I-5 that the action alternatives are designed to address. The FEIS should include an analysis of the foreseeable costs and benefits to the local economy of elevating I-5 under the no action alternative.

Response: *The estimated annual cost has been revised to \$9,122,060.00. This does not include costs associated with raising I-5 to meet flood clearance requirements. This will be clarified in the FEIS.*

Alternative 4 -Levee Setback

The FEIS needs to expand or clearly state that Alternative 4, the Levee Setback Alternative, alone does not meet one of the critical criteria of the Flood Hazard Reduction Project. This issue is a very important factor in evaluating the downstream impacts of flooding to the Chehalis Tribe. The DEIS states that this alternative would slightly increase downstream flood stages and this impact would not be significant because of Skookumchuck Dam modifications. (As stated in meetings with the tribe, even a slight increase would cause significant impacts and hardships to the tribe.) If for some reason the dam is not part of the final Corps project, additional measures would need to be incorporated to meet the downstream flood stage criteria. The Corps needs to address these measures here or in another section in the FEIS.

Response: *As noted in the DEIS, the downstream flood stage increases would be very small. Analysis indicates that construction of the Chehalis River levees without the addition of the Skookumchuck Dam modifications would cause the 100-year flood peak stage to increase by a maximum of 0.1 foot downstream of Centralia. This information will be included in the FEIS. Modification of the Skookumchuck Dam is a part of the preferred alternative; therefore additional measures to meet downstream flood stage criteria are not included here or elsewhere in the EIS as part of this alternative.*

Alternative 6 -Non-structural Alternative

Alternative 6, the Non-structural Alternative, should be carried through in the FEIS because it will lay out a template for the county to address flooding if federal funding does not become available for a more structural approach. Alternative 6 was developed to evaluate other options to reduce flood hazards in the project area compared to structural components (e.g. dams, excavated channels and levees) that were proposed in this document and in past planning documents. This alternative also includes Lewis County's commitment to develop an effective floodplain management plan and to implement strong enforcement of a floodplain policy to reduce future flood damage in the project area.

Response: *The Corps' study team conducted a thorough review of county and city floodplain regulations and their enforcement and found that all local jurisdictions are in compliance with federal NFIP and state floodplain regulations. In order to implement the Corps project following authorization, the local sponsor must commit to a post-project floodplain management plan that is in compliance with NFIP and Executive Order 11988. Although the existing flood maps accurately represent flooding conditions in significant portions of the project study area, hydraulic modeling completed in the course of this project may allow Lewis County to become a Cooperating Technical Partner with FEMA. This could facilitate reconciliation of FEMA flood maps with "best available" flood information for the existing condition and would allow the local jurisdictions to begin using the new information in regulating land uses in the area. It would also set the stage for adoption of new FEMA flood maps in digital format.*

Alternative 7 -Interagency Committee Alternative

The FEIS needs to fully evaluate Alternative 7, the Interagency Committee Alternative, similar to the in-depth evaluation given to Alternative 2 in the DEIS and carry out through more aggressively in the FEIS. EP A has been working with the Corps Lewis, Washington Department of Transportation, the Chehalis Tribe, and state and federal resources agencies for the past three plus years in looking at alternatives that meet the purpose and need of the flood hazard reduction project and incorporate long range environmental sustainability. Out of this effort, Alternative 7 was submitted to the Corps and Lewis County that the Interagency Committee to be fully evaluated in the EIS.

Alternative 7 takes a long range systematic approach regarding the historic flooding of the Chehalis River, including environmental degradation of the aquatic environment. Moreover, Alternative 7 focuses on non-structural solutions first and then moves towards structural approaches when non-structural approaches are not adequate. The interagency committee expected that this alternative, or a similar alternative, would be carried forward into the FEIS and equally compared to the other remaining alternatives.

Response: *This alternative was carried further in the evaluation of alternatives, cite page 41 of the DEIS. Hydraulic and economic modeling was conducted on Alternative 7, utilizing the systematic approach that the committee developed. During this stage of the evaluation, Alternative 7 was determined not to be the preferred alternative. The alternative was not economically beneficial, that is the costs of construction exceeded the benefits of the flood reduction. This discussion is on page 45 of the DEIS.*

Preferred Alternative -Alternatives 2 and 4

The FEIS should identify what parts of the preferred alternative could be funded by the Corps and what parts would be under the control of the other federal and state agencies, local governments.

Response: *Section 2.5.3, Non-Structural Features, indicates the non-structural features from Alternative 6 that are incorporated as part of the preferred alternative. These include (1) elevation of structures, (2) definition of a new 100-year FEMA floodplain, (3) appropriate improvements in the flood warning system, (4) restriction of development in floodways and other critical floodplain areas, (5) restriction of filling in the floodplain, and (6) appropriate improvements to local stormwater management plans. As stated in Section 2.5.3, the local sponsor will implement the listed actions to the maximum extent possible; the actions will be included in the revised floodplain management plan for the project. The Corps will review and approve the revised plan to insure that the non-structural project components are appropriately incorporated into the plan, and will provide technical support to assist in development of non-structural features to assure the integrity of the project structural components.*

EPA Proposed Alternative

Alternative 8

EPA recommends that a sustainable alternative be developed which combines the Corps preferred alternative with elements that incorporate fish and wildlife habitat improvements. This 8th Alternative would move to meet all critical criteria and use a systematic and phased environmental sustainable approach that is supported by Corps Headquarters and would more fully incorporate fish and wildlife recovery using a watershed approach.

Below is a short list of potential elements that could be included into the Proposed Alternative. This list includes elements from all action Alternatives (2, 3, 4, 5, 6, and 7). Viable elements in Alternative 3 include floodway modifications to the Mellen Street bridge and SR-6 Bypass excavations to reconnect segments of the historic floodplains. Viable elements in Alternative 4 include setback levees and floodwalls. Viable portions of Alternative 6 include restrictions on floodplain development and improved watershed management (active reforestation and timber harvest control). Viable portions of Alternative 7 include acquisition of frequently flooded areas and structures, improved upland storage, and relocation or elevation of structured.

We see viable elements in Alternative 5 that support small headwater dams. The Corps rejected Alternative 5 (Flow Restrictors) because the flow restrictors could not significantly reduce flooding during the 100-year flood event. This alternative was presented by the Chehalis Tribe knowing that it would not prevent flooding at the 100 year flood level. The tribe suggested, however, that the flow restrictors could be incorporated to reduce flood hazards on smaller flooding events.

The benefits of this proposed alternative is that it is less environmentally disruptive and promotes restoration of watershed processes. Currently, floodplain functions and processes have become disconnected from the river. As stated in the DEIS, the "Chehalis River has been remarkably stable during the last 50 years, with [minimal] lateral migration" (page 81) in spite of the large

floods of 1990 and 1996. Furthermore, "human activities have led to widespread riparian vegetation loss, reduced shading levels, and floodplain isolation contributing to increase water temperatures" (page 88). To restore watershed processes within a portion of the Chehalis River watershed, our suggestions are to:

- Reconnect the mainstem and tributaries to abandoned backwater areas and oxbows by assisting lateral stream migration within the floodplain to improve floodplain hydrologic processes and storage capacity,
- Promote revegetation of the riparian corridor to improve shading and filtration processes which will improve habitat and water quality, and
- Mitigate for critical structural impacts within the floodplain. For example, modifications to the Mellen Street bridge could greatly improve existing bottleneck conditions that restrict passage of flood event flows.

Response: *Hydraulic modeling showed that all of the structural measures of Alternative 7 would have to be implemented to meet project criteria. This resulted in costs that could not be economically justified. However, as described in the DEIS, the Corps further evaluated additional configurations of Alternative 7 (e.g., with levees, with various dam modifications) to determine if this alternative could be made viable. Although the Corps did not call out the additional configurations of Alternative 7 as a separate alternative, we believe that this additional effort is consistent with EPA's recommendation that an 8th alternative be developed and evaluated.*

Floodplain Management

Executive Order 11988

The project should comply with Executive Order (EO) 11988, Floodplain Management. The objective of EO 11988 "is to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. "Residential and commercial construction activities are still being permitted by the local governments in the Project's floodplain study area. These actions appear to be in conflict not only with the intent of EO 11988, but would directly affect the cost benefit analysis and impact alternative analysis. EPA understands that the Corps can not restrict current land use development. However, the Corps may find itself in conflict with EO 11988 if residential and commercial development continue to occur in the flood hazard areas prior to the Record of Decision on the Project.

Response: *FEMA is working on remapping, that will include the floodways, and these should be in place prior to the construction of the project. The Corps will work with the local communities to avoid, to the extent practical, any proposed development that would adversely impact the selected alternative or would be in conflict with Executive Order 11988. As stated the project will not be implemented without a new floodplain management plan that reflects the project.*

Approved Floodplain Maps

The Corps should require that the floodplain mapping and Lewis County's Flood Plan be completed and approved before the PHIS is issued so that alternatives can be better evaluated

and be better drafted to comply with EO 11988. Without approved and accurate floodplain and floodway maps, alternatives can not be adequately evaluated either during the development of the cost benefit analysis or in meeting the purpose of the DEIS in addressing flood hazard reduction in the project area.

Response: *FEMA is currently working to coordinate initiation of remapping in the project area. FEMA will be utilizing the existing conditions analysis work conducted for this study to develop new mapping for the area prior to a flood reduction project being completed. It is not likely that the new maps will be completed prior to the completion of the EIS, however.*

The issue of finalizing the 100 year floodplain in Lewis County has been a continual topic for the past four years and has caused frustration with the resource agencies as we attempted to develop a flood hazard reduction plan alternative. EPA has requested a number of times that the 100 year floodplain maps be finalized before any further development be permitted in flood prone areas within the project study area, and that the Corps require finalization before they complete the FEIS. EPA and the other resource agencies find it very difficult to address flooding and the environmental impacts in the project area as ongoing land use decisions are being made by the county that affect the alternatives that are being developed by the Corps and identifying potential restoration actions. In addition, the lack of these maps creates a significant information gap and may not comply with Executive Order 11988 Floodplain Management Guidelines. Floodplain mapping should be one of the priorities of the FEIS study to directly assist in assessment and decision-making, and new floodplain maps should be completed and approved by Federal Emergency Management Act (FEMA) before the FEIS is developed.

Response: *The FEMA approval process takes several years to develop new floodplain mapping. FEMA will be utilizing the existing conditions analysis work conducted for this study to develop new mapping for the area prior to a flood reduction project being completed. It is not likely that the new maps will be complete prior to the completion of the EIS, however, the Corps and FEMA have initiated discussions as to intent and general scheduling of the new mapping. FEMA does intend to start remapping to include the project when construction of the project begins.*

Lewis County's Flood Plan

EPA recommends that the Corps be one of the approving agencies of the Lewis County Flood Plan that the Plan be approved prior to the implementation of the Project and that a clarifying statement be added stating that the county's new Flood Plan must be approved by the Corps prior to the implementation of the flood hazard reduction project. Although it is unclear who would be approving the county's new floodplain management plan, EPA believes that the Corps should be a part of this approval process so that the new floodplain management plan meets the requirements of Executive Order 11988.

Indirect and Cumulative Impacts

Section 4.1.3.2- Long-term Effects (page 169)

Additional information is needed to fully understand the long-term impact of the preferred alternative. As stated in the DEIS, the preferred alternative " would alter flood hydrology and hydraulics in the project area. ..[and] ...would result in some reduction of the floodplain area that

is inundated and alter floodwater storage." The DEIS needs to further expand this section by (1) approximating amount of acres historically within the floodplain; (2) specifying the current extent of lost flood storage capacity; and (3) use the acreage analysis to aid in describing other areas of impacts for clarification. This information is needed to evaluate cumulative impacts directly linked to past, present, and reasonably foreseeable future effects as required by NEPA (40 CFR 1508.7). This would include addressing a number of activities that are being planned in the floodplain (e.g. widening of I-5, commercial development) that would add impervious surfaces to the floodplain and likely effect the hydrology and hydraulics of the Chehalis River watershed.

Response: *With the exception of some of the proposed levee sections along the lower reach of the Skookumchuck River, most of the proposed levee sections will be set back significantly from existing stream channels. This limits the loss of floodplain storage attributable to the preferred alternative. For instance, proposed levees along the Chehalis River will be mostly set back significantly from the east side of the channel (there is no levee proposed along the west side of the channel) and will be mostly situated adjacent to Interstate 5. As a result, flooding in the active portion of the existing floodplain on the west side of I-5 under the preferred alternative will be very similar to pre-project flooding (i.e., the spatial extent and depth of flooding within the active floodplain will be largely unchanged).*

The most notable change to flooding within the Chehalis River valley under the preferred alternative is a reduction in flooding in the mostly urban areas along the east side of I-5. It is estimated that the preferred alternative would eliminate flooding over an area of roughly 2,500 acres in the vicinity of Chehalis and Centralia during a 100-year flood event (this compares with an inundation area of roughly 16,000 acres in the vicinity of Chehalis and Centralia during a 100-year flood under pre-project [existing] conditions). Most of the area eliminated from flooding is highly urbanized land located on the east side of I-5. A large percentage of this area is covered by impervious surfaces (i.e., roads, parking lots, buildings, etc.). Additionally, most of the areas on the east side of I-5 that have historically flooded from the Chehalis River have generally functioned mostly as backwater storage areas during flood events and have had very limited function in terms of providing downstream conveyance of flood flows. Because most of the active floodplain will be unaltered by the preferred alternative, use of set back levees to eliminate flooding in the mostly urban areas outside of the active floodplain will have only a slight impact (generally several inches or less) on flood stages within the active floodplain. Furthermore, operation of the Skookumchuck reservoir for flood control purposes will provide up to 20,000 acre-feet of flood storage that will offset the loss of flood storage attributable to the proposed levees and will hence offset any downstream peak water surface increases attributable to the proposed levees. The net result of the effects of all components of the preferred alternative will actually be a net increase in flood storage resulting in a slight reduction in peak water levels in the Chehalis River downstream of Centralia during flood events.

Section 4.3- Water Quality (page 175)

Clarify what effects, if any, the proposed Project would have on water quality within the project area, especially Clean Water Act (CWA) 303(d) waters. The Chehalis River is currently on the state list of CWA303(d) impaired water bodies for temperature and fecal coliform. Under this

designation no activity should occur that will negatively affect a listed impaired water body. This would include activities that may have either temporary or long-term water quality impacts.

Response: *Section 3.3 describes in detail the current condition of the water quality in the upper Chehalis Basin and the impacts from human actions. However, the section referenced in the above comment has been edited to include brief descriptions of water quality issues.*

Potential Restoration Sites

Section 2.6- Potential Restoration Sites (page 57)

The Corps has identified 16 potential environmental restoration sites. More details need to be provided in this section, including:

- A ranking of each potential site for restoration,
- Types of functions that this restoration would replace,
- Estimated cost to restore targeted functions, and
- Required monitoring for each restoration site.

Response: *The Corps is including as an appendix to the FEIS the report that was accomplished on the restoration sites. However, it must be understood that some of the proposed restoration sites have been changed to the mitigation site. It also must be understood that restoration is the burden of the sponsor to obtain the real estate for restoration to occur.*

Additional Comments

Section 1.1 -Figure 1.1 (page 2)

It would be helpful to label the Skookumchuck and Newaukum rivers.

Section 2.2 -Major Project Criteria

Figure 2.1, page 18 -This figure is bleached and unreadable.

Response: *This has been corrected.*

Criteria 2 (page 19) -Decrease the transportation closure during flooding...

Regarding the third sentence wherein it states that Washington State Department of Transportation is widening 1-5 in this portion of the project area to not only improve "safety, efficiency, and convenience," but to add capacity by adding two additional lanes of freeway. This proposed modification needs to be stated in the FEIS.

Response: *This will be added in the FEIS.*

Please state in the FEIS where Federal Highway Administration flood clearance requirements are not currently being met in the project area (e.g. 50 year flood level).

Response: *This information will be provided in the FEIS.*

Table 2.4-1- Project Economic Analysis (pages 42- 44)

This is good information for the public in describing the economic outcomes of the alternatives. However, it is very difficult to follow. Please expand Table 2.4-1 so it is easier to read and more clearly describes the alternative that is being evaluated.

Response: *The table will be revised as suggested.*

Section 2.5.3- Non structural Features

Regarding: Table 2.5.3-1 - *Cost of Elevating Structures with Induced Flooding* (page 53): Please state if this table was developed using the old 100 year floodplain maps or the new floodplain map developed but not approved by the county.

Response: *Table 2.5.3-1 was developed using the new floodplain map that was developed as part of the project. Please refer to earlier discussion regarding adoption of the new FEMA floodplain map.*

Define a New 100 year FEMA Floodplain (page 53)

Expand this section to clearly layout the procedures needed to approve of the new FEMA floodplain map. It is very important to accurately address economic impacts and costs associated with a 100 year flood with a updated FEMA map. It is EPA' s understanding that the new map has been developed and is awaiting approval.

Response: *Please refer to earlier discussion of adoption of the new FEMA floodplain map.*

Section 3.2 -River Geomorphology

We highly recommend that the FEIS include relevant geomorphological information of regional glacial activity to clarify why the Chehalis River valley in the project area is so flood prone. The FEIS should examine and disclose how historical glacial activity affected landform morphology in the project area. In reviewing recent geological information, no other land forming activity has influenced the current characteristics within the project area as the extensive glacial ice sheets that occupied northwestern North America in the early to late Pleistocene. Especially relevant to the Puget Sound area is the Puget Lobe of the Cordilleran Ice Sheet and its associated meltwater channels that aided in formation of the nearly level to gently sloping alluvial lands of the Chehalis valley.

Response: *The glacial activity that occurred in this area actually stopped just north of Centralia. This area would have been a runoff area for the melting glaciers.*

Section 3.9- Land Use and Planning

The FEIS should disclose information on all floodplain influences attributed to proposed I-5 improvements. I-5 existing influences and any proposed infrastructure changes on Chehalis floodplain dynamics were not adequately disclosed within the DEIS.

Response: *The floodplain influences of the I-5 roadway are part of the existing condition, and as such were accounted for in the modeling conducted for this project. I-5 is only one feature that has had an impact on basin dynamics; historically, there have been many others. The EIS will not evaluate in detail the historic impacts of any one particular feature. The effects of I-5*

construction on the basin are described generally in Section 6, as are the effects of historic navigation projects, logging, agricultural development, residential and commercial development, and construction of rail lines and other roadways. All of these actions and features have had an effect on the basin, and the major impacts are listed and discussed in 7.1.1.

Section 3.13.3- Potential Hazardous Toxic and Radioactive Waste Concerns (page 155)

To better transmit the information to the concerned public and government agencies, this section should list which of these sites is under federal clean up authority and which are under state authority. In addition, an area map showing their location is needed.

Response: *An appendix was prepared (Appendix D) for the DEIS that provides the information requested, describes a preliminary assessment as well as lists all sites within the study area. Maps of the project and study area are provided, either within the appendix or as an attachment.*

Chapter 4 -Environmental Effects -Scheuber Ditch/SR-6 Mitigation (page 166)

The Corps has presented the Scheuber Ditch/SR-6 Mitigation as the main action to offset the aquatic resource impacts identified by the preferred alternative. EPA would like to see a conceptual drawing or figure so as to assist reviewers in showing the extent of the proposed mitigation plan. The Corps will also need to conduct a wetland functions and values analysis of the current conditions within the mitigation site and then determine what benefits the proposed mitigation would have on these existing conditions. This evaluation will then be used to determine if the proposed mitigation compensates for the lost wetland functions and values of the built project.

Response: *A conceptual site plan of the Scheuber ditch mitigation area will be included in the FEIS. Additional work at the mitigation site will be done as part of final design. That work will include specific delineation of existing wetlands at the mitigation site as well as an assessment of wetland functions currently being provided by the site.*

Section 4.1.5- Mitigation (page 172)

This section needs to be expanded to explain the actions the Corps will undertake to minimize impacts on the hydrology of the Chehalis River. These actions would include showing where floodwalls may be constructed to avoid wetlands, and where proposed levees have been shifted away from aquatic areas.

Response: *This section will be expanded to include this information.*

Section 4.3.6 -Mitigation (page 177)

The mitigation section for water quality should specifically explain how these proposed actions would mitigate for potential project impacts to water quality, what these actions are and how they will be implemented. In addition, an additional mitigation measure should identify which land use activities would be permitted within the project area and in particular within the levee setbacks.

Response: *This section has been edited to increase detail of mitigation. The Corps is working with the local and state agencies to develop a floodplain management plan that would*

discourage or restrict development within the floodplain. Regarding floodplain development, the local sponsor must commit to a post-project floodplain management plan that is in compliance with NFIP and Executive Order 11988 in order to implement the Corps project. The executive order is intended to avoid to the extent possible the impacts associated with occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever practicable. Land use development restrictions fall under the jurisdiction of state and local authorities

Section 4.4 – Biological resources – Vegetation and Wetland and Riparian Areas (page 178)

To help in clearly identifying impacts to wetlands, riparian habitat and their buffers, the Corps needs to expand the discussion to include impacts to wetland and stream buffers. This could be done by adding these elements to Table 4.4-1 (page 182). In addition, a series of maps should be included showing the preferred alternative along with the wetland, riparian habitat and buffers that would be impacted by the levee system

Response: *The purpose of the set back levees is to remove them from the riparian areas and this was accomplished. There are a couple of locations that the levee system will be very close to the rivers edge, however, there is no riparian area there as the interstate abuts the riverbank at those locations. The impacts to the wetlands are the wetlands that are marginal and are agriculture in use at this time. These are prior converted wetlands.*

Section 4.4.6- Mitigation (page 187)

The Corps will need to conduct a wetland function value analysis on all wetlands impacted by the preferred alternative. To EPA's knowledge, and in reviewing Appendix C "Wetland and Riparian Report," this has not been done. Once this has been completed, these losses can be weighted against those being developed in the Scheubert Ditch mitigation site.

Response: *During final design, additional site work will be done to more precisely determine project impacts to wetlands and riparian areas. This work will include specific delineation of wetlands affected by project components as well as an assessment of functions being provided by these wetlands.*

Section 4.8- Land Use and Planning (page 215)

4.8.2- Criteria for Determining Significance of Effects (page 216)

An additional screening criteria for significance needs to be added that would weight the compliance with applicable land use requirements. In particular, compliance with Executive Order 11988 on floodplain development.

Response: *Compliance with Executive Order 11988 and other applicable federal land use requirements is included in the final bullet item, which includes "land use plans, policies, or regulations of any entity with jurisdiction over the area... [emphasis added]."*

Thank you for the opportunity to partner with your agency and Lewis County on this important project. We also appreciate the opportunity to review the draft EIS/GRR for the Centralia Flood Damage Reduction Project.

Generally, the alternative selected eliminates many of the project elements that posed the most risk to transportation infrastructure and the environment. A number of concerns expressed about the 40 percent draft document were associated with the Floodplain Excavation and Floodway Bypass alternative. Resolution of these concerns speaks positively of the alternative selection process, which despite being arduous has selected what appears to be the best alternative in terms of reducing flood hazard, while minimizing environmental impact as well as potential impact to the transportation infrastructure. We feel that this also speaks well of the cooperative working relationship that has developed between the Corps of Engineers, Lewis County, and WSDOT over the course of this process.

WSDOT has the following specific comments on the completed draft EIS/GRR for the Chehalis Flood Hazard Reduction Project:

The 18th Amendment to the State Constitution requires state gas tax dollars to be spent directly on highways. WSDOT is prohibited by this amendment from using R51 gas tax revenue to fund any local rights of way buy-ups above and beyond the NED plan as alluded to on page 170 of the GRR and other locations in the document. WSDOT does not oppose the “additional buy-ups”, but we find it important to clarify inferences of funding such buy-ups.

Response: *Agreed. This will be apart of the final financial plan for the project.*

It would be nice to refer to our agency as WSDOT, not WDOT, DOT, & WA-DOT throughout the documents.

Response: *This will be corrected.*

General reference throughout all documents, regarding Reach 9 & 10, that WSDOT may construct their project before the NED Plan is constructed; therefore alleviating the need to relocate Dillenbaugh Creek is not valid. It may take the WSDOT ten to twenty years to improve this section. It is highly unlikely I-5 will be widened in the locations where it was overtopped by floodwaters before the Corps project or another solution is in place. Therefore, this assumption should be changed throughout the document.

Response: *This will be corrected in the FGRR and detailed in further design effort, in coordination with WSDOT.*

DGRR, Page 5, paragraph 2, line 2, states that the grade of I-5 would need to be raised 12 feet; yet in the DEIS, Page 143, paragraph 1, second to the last line, states the grade would need to be raised up to 6 feet. For consistency reasons, the “up to 12 feet” reference would be more appropriate. We also recommend that the flood elevations be verified to the I-5 Freeway elevations.

Response: *This will be corrected in the FEIS.*

DGRR, Page 60, paragraph 1, last line, states 12 percent truck traffic, WSDOT data identifies this percentage to be 18.

Response: *This will be corrected in the FGRR.*

DGRR, Page 80, paragraph 2, line 4, 1-5 should be I-5.

Response: *This will be corrected in the FGRR.*

DGRR, Page 138, first bullet, oxbow (north of SR-6) should be oxbow (south of SR-6).

Response: *This reference is correct, that plan had an additional oxbow reconnection north of SR-6.*

DGRR, Page 166, Table 6-2, what is the significance in the reference to (WSDOT) in the table?

Response: *This reference is to identify the agency that real estate will need to be coordinated with. The reference will be removed.*

DEIS, Page C23, the paragraph after the tables states that the relocation of Dillenbaugh Creek will not be required nor will any wetlands be impacted. WSDOT's preliminary design for this interchange requires a bigger footprint in this area. Previous discussions with the Corps identified the need to relocate Dillenbaugh Creek further west and that a levee would be used for flood protection, possibly becoming a part of the Labree road extension.

Response: *This will be corrected in the FEIS.*

Description of Preferred Alternative (DEIS, page 50), Hydrologic Impacts (DEIS, page 170), Long-term Impacts to Fish (DEIS, page 197): As we mentioned in our comments on the 40 percent draft document, there needs to be some discussion of how the flap gate on Dillenbaugh would operate, and the impacts of this structure on hydrology and fish passage.

- How often would the gate close (what frequency of flood event)?
- What effect would gate closure have on upstream flooding along Dillenbaugh?
- Are there impacts to fish passage when the gate is closed?
- Flap gates are notorious for failing at critical times. How would debris and sediment impacts to the structure be addressed?
- Would there be special provisions for maintenance of the gate, and what would be the impacts of gate failure?

Response:

- *The gate would only be closed at 100-year event to ensure that the levee will provide 100-year protection.*
- *The gate closure will not affect upstream flooding. The purpose of the gates is to protect against Chehalis backwater during that 100-year event.*

- *Because the operation of this structure is only during a 100-year event, the impact to fish would be negligible. During low flow conditions the structures would be fish passable.*
- *The design of this structure is not a typical flap gate, though these concerns will be taken into consideration during the final design of the structures.*
- *The operation and maintenance will be built into the design and operations plan that will be executed by the county emergency management office. Maintenance inspections will be conducted annually. If the gates do fail, flooding will not be significantly worse than under existing conditions.*

DEIS, Page 279, please change the Department of Transportation contact to the following:
Becky Michaliszyn
Washington Department of Transportation
P.O. Box 1709
Vancouver, WA 98668-1709

Response: *This will be corrected in the FEIS.*

Throughout the documents, Reach 9 and 10 are incorrectly described and drawn according to future WSDOT needs in this area. We have contacted Beth Coffey and Norman Skjelbreia regarding this matter and we requested that these two reaches be refined to represent our needs for the future interchange configuration.

Response: *These will be further detailed during design, per discussions with WSDOT.*

The Green Hill wetland mitigation site is funded by the WSDOT, and is intended for WSDOT mitigation needs resulting from I-5 widening. The site is located in the northwest quadrant of the Rice/13th Street interchange. Dillenbaugh Creek flows between the freeway right of way line, on the west side and the easterly property line of the Green Hill wetland bank.

Response: *This description will be incorporated into the FEIS.*

Thank you again for the opportunity to partner on this project.

<signed>

Bart S. Gernhart, P.E.

Project Development Engineer

Wetlands, Riparian and Mitigation Comments:

Is enhancement the major portion of the proposed wetland mitigation? It appears more mitigation area may be required to meet regulatory conditions if enhancement is the major driver of the proposed mitigation.

Response: *The mitigation actions will include a combination of creation, restoration, and enhancement of wetlands, as well as creation and restoration of open water areas and riparian habitats. Under existing conditions, the mitigation site includes upland areas and wetlands, as well as areas with mapped hydric soils that likely have been tiled and drained, and which no*

longer exhibit the vegetation or hydrologic characteristics of wetlands. A specific delineation of existing wetlands at the mitigation site will be done as part of final design. As currently envisioned, the mitigation actions would provide up to 126 acres of wetland complex and up to 75 acres of riparian habitat; because these actions would be focused at a single site, they are expected to provide habitat and hydrologic benefits at the landscape scale. Since the total acreage of wetland loss from the project is estimated at approximately 34 acres, the mitigation proposal should be adequate to offset the loss of wetland area and function. In the unlikely event that more mitigation is needed, the site provides ample opportunity for additional mitigation actions.

Has or will the design of the mitigation take into account the “high flow episodes” that will occur?

Response: *Yes. Because a fundamental goal of the mitigation actions is to reconnect the Chehalis River with a portion of its historic floodplain, the mitigation site will be designed to accommodate flows from the 1- to 2-year event as well as larger, less frequent floods. As such, the mitigation areas will be designed to mimic wetland and riparian habitats that likely existed at one time in the floodplain. Those wetlands and riparian areas would have been subjected to episodic flows from floods ranging from annual high winter flows to major events. Site elevations, species planted, and stabilization measures selected during final design will take into account the potential effects of high flows on the mitigation site.*

Mitigation ratios for mitigation begin at 2-3:1 for creation / restoration and 4-6:1 for enhancement. These are beginning numbers and can move up or down depending on a number of variables, some of which are: the type of wetlands impacted, type of wetland proposed for mitigation, the quality of the proposed mitigation, amount of wetland impacted, temporal considerations and location.

There are possible wetland impacts from the higher Skookumchuck Dam storage elevations. Have the wetlands around the lake been delineated? Any discussions on what potential impacts could occur? It is discussed that storage of floodwaters would only be held approximately 5 days but table 3.1-1 shows that storms can last 3 to 4 days or more and release a large amount of water. Keeping hydrology at higher levels behind the dam could cause impacts to wetland areas especially during periods of spring growth.

Response: *A report (Fish, Riparian and Wildlife Habitat Study) was completed by Pacific International Engineering and GeoEngineering for Lewis County in November 2001 that looked at the habitat surrounding the Skookumchuck reservoir and they found no wetlands that could be impacted by the project. The plan is to hold the water at the higher elevation for a maximum of 5 days only and then start the release.*

There are more impacts than just the footprint of the levels to consider. Hydrology impacts to wetlands bisected or disconnected from its hydrology source(s) also need to be considered. Buffers will also need to be implemented to protect wetland functions. There needs to be some explanation on what the Corps means between “buffers” and “setback”.

Response: *Setback means the levees will be setback from the levee as far as design will allow to reduce the potential impacts. A buffer is an area that has been protected from impacts by the project. Only prior converted wetlands (agriculture & developed) will be disconnected from the floodplain and those areas are minimal by design.*

Excavation in existing wetlands could be considered impact depending on what ecological functions are being addressed. The mitigation plan will need to explicitly describe the impacts and proposed environmental gains.

Response: *Potential impacts of the mitigation actions are described in the introduction to Chapter 4 in the FEIS. During final design, additional site work will be done to more precisely determine project impacts to wetlands and riparian areas. Environmental gains are described in the subsections for each discipline; in particular, please refer to Section 4.1.5, 4.4.6, 4.5.6, 4.6.5, and 4.7.5. Specific environmental gains will be further defined during the project design phase.*

Was the information in Tables 3.4-1 & 2 and 4.4-1 taken off NWI and soil surveys? NWI maps are known to under-estimate forested wetland area and misrepresent emergent wetland area. A detailed delineation of the immediate project wetlands will be needed to determine wetland characteristics impacted by the project.

Response: *A complete delineation of all wetlands associated with the project will be carried out before construction.*

Riparian habitat is driven by a pretty precise hydrologic regime; have hydrologic studies been done to help evaluate if this type of mitigation is feasible at the location(s) proposed?

Response: *Riparian habitat throughout the project area has been observed in inundated, saturated, depressional, and upland conditions and has, as is typical of riparian communities, adapted to a variety of moisture regimes, including those that fluctuate seasonally. The species composition of the riparian community varies with the hydrology at each location. Soil surveys at the proposed mitigation site indicate that the water table is near the surface throughout most of the growing season. Hydraulic modeling indicates that flows can be introduced to the site with regular frequency to support wetland and riparian vegetation. Further hydrologic studies are not necessary to evaluate the feasibility of the mitigation proposal.*

How does the habitat restoration plan project fit in with this project?

Response: *The habitat restoration plan will be used as property becomes available for use. Habitat restoration will be actively pursued based on the restoration plan to the maximum extent allowable.*

Floodplain Comments:

What will flows be in 2yr, 10yr, 25yr and 50yr events? What does modeling show the floodplain will look like in these episodes?

Response: *Peak flows during these events vary depending on the specific stream reach. For instance, estimated peak flows in the Chehalis River at a location just upstream of its confluence with the Skookumchuck River for the preferred alternative for the 2-year, 10-year, 25-year, and 50-year events are about 19,500 cfs, 34,000 cfs, 42,500 cfs, and 48,700 cfs, respectively. The spatial extent of flooding during these events for the preferred alternative will depend on the specific stream reach. For instance, flooding within the active floodplain of the Chehalis River along its reach between Chehalis and Centralia will be spatially similar for these events compared to flooding under pre-project conditions. Because the proposed levee along this reach is significantly set back from the east side of the channel (there is no levee along the west side of the channel) and is mostly situated adjacent to I-5, flooding in the active portion of the existing floodplain on the west side of I-5 under the preferred alternative will be very similar to pre-project flooding (i.e., the spatial extent and depth of flooding will be largely unchanged). The most notable change to flooding along this reach under the preferred alternative is that flooding will be greatly reduced in the mostly urban areas along the east side of I-5. Spatial changes in flooding will depend on the particular flood event. For instance, the preferred alternative will likely have little effect on flooding on the east side of I-5 during a 2-year event since this area generally doesn't flood under pre-project (existing) conditions. Conversely, the preferred alternative will greatly reduce the spatial extent of flooding on the east side of I-5 during a 50-year event (most of the area protected from flooding on the east side of I-5 is highly urbanized and much of the area is covered by impervious surfaces). However, it should be noted that areas on the east side of I-5 that have historically flooded from the Chehalis River have generally functioned mostly as backwater storage areas during flood events and have had very limited function in terms of providing downstream conveyance of flood flows.*

What about upstream actions that have taken place which will further compound potential problems in this area. Have these issues (i.e. Napavine) been addressed and discussed? Figure 2.1 (pg 18) shows the study area to include the area near Exit 72 on I-5. Large amounts of fill have been placed in this area, which will alter the characteristics of the Newaukum River and the Chehalis River. Has this been studied and discussed?

Response: *Figure 2.1 shows the general extent of the study area. The actual extent of the study area is largely reflected by the spatial extent of floodplain areas that were incorporated into the hydraulic model used to evaluate various project alternatives. The hydraulic model only covers the lower 4 miles of the Newaukum River and therefore does not extend sufficiently far enough upstream to the reach of the river near exit 72 of I-5. (Note that the limited extent of hydraulic modeling along the Newaukum River is largely dictated by limited backwater effects from the Chehalis River, which only affect the lower 1 or 2 miles of the Newaukum River.) As a result, potential changes to the Newaukum River floodplain in the vicinity of exit 72 are outside of the current study area. Furthermore, while the localized placement of fill along this reach of the Newaukum River may have localized impacts to flooding in this area, this action is not expected to impact downstream flooding along the Newaukum or Chehalis River. As a result, this action is not expected to negatively impact the preferred alternative.*

A general comment on the EIS is that it would be helpful if there were an addendum that describes how this project has been evaluated relative to the requirements found in Federal Executive Orders 11988 (Floodplain Management) and 11990 (Wetlands Protection).

Response: Chapter 4 of the DEIS provides the disclosure for the Federal Executive Order 11990. As noted in the DEIS (11988) the Corps is maintaining a large portion of the floodplain by restricting the levee system to the current planned location. This will help to preserve the benefits of the floodplain while reducing the flood losses. Basically, the entire DEIS constitutes the evaluations used for the above-mentioned executive orders.

On pages 23-24 and 231 and other areas of the report that deal with the Skookumchuck Dam modifications, further information is needed regarding: A) the potential downstream impacts of the various alternatives relating to the dam modifications and why no warning system for downstream residents is proposed and B) a description of the plan for operation and maintenance of the dam post-modifications and a plan for transfer of ownership to a designated entity.

Response: Additional information will be added to the FEIS to address the operation and maintenance of the dam and the plan for the transfer of ownership to a flood district. The plan does not include a warning system for downstream residents.

On page 124, Section 3.8.1.3, there is a statement that, “a new 100-year floodway has been calculated.” It logically follows then that a new 100-year floodplain has also been delineated for this area. It would be helpful to learn why this information/data has not been submitted to the Federal Emergency Management Agency for the preparation of revised flood hazard maps.

Response: FEMA will take the mapping from this study and develop new FIRM maps to delineate the floodplain and floodway. FEMA will be utilizing the existing conditions analysis work conducted for this study to develop new mapping for the area prior to a flood reduction project being completed.

On page 147, Section 3.10.7, there is a statement that, “During flood events interchanges 81 & 82 are impassable” (as are other interchanges). This needs to be clarified to identify the magnitude of the “flood event.”

Response: The vulnerability of I-5 interchanges to flooding under existing (pre-project) conditions is dependent on the specific characteristics of each interchange. For example, factors such as road surface elevations within the interchange, proximity to river reaches (i.e., Chehalis or Skookumchuck River), and local features that influence the spatial extent of flooding (i.e., local topography and anthropogenic features such as levees and transportation corridors) determine the vulnerability of a specific interchange to flooding. The vulnerability of interchanges at milepost 81 (Mellen St.) and milepost 82 (Harrison St.) to flooding under existing conditions was estimated based on a comparison of simulated peak river stages during specific flood events with existing roadbed elevations within these interchanges. This evaluation suggests that the interchange at milepost 81 (Mellen St.) becomes impassible during a Chehalis River flood event with a return interval of approximately 25 years or greater while the interchange at milepost 82 (Harrison St.) becomes impassible during a Skookumchuck River flood event with a return interval of approximately 5 years or greater (flooding from the Skookumchuck River rather than from the Chehalis River appears to have the most significant influence on flooding at the Harrison St. interchange). It should be noted that while the provided

flood return intervals represent the estimated return intervals at which the given interchange areas will begin to flood, critical transportation corridors that connect the interchanges to surrounding streets may in some cases have a higher vulnerability to flooding relative to the interchanges.

Shoreline Management Act, Shoreline Master Program and Shoreline Permit Comments:

Each municipality and county listed in Section 3.8 (Land Use) of the DEIS has its own shoreline master program with its own set of regulations and policies regarding development on shorelines within its jurisdiction. Development associated with this project must be consistent with the regulations and policies of the Shoreline Master Program for the jurisdiction within which it occurs. Of particular importance in regard to this project is fill in the floodway, water ward of ordinary high water mark, or in wetlands is prohibited outright in the shoreline master programs for the cities of Chehalis and Pe Ell. (See General regulations and Landfill regulations in the Chehalis SMP and Landfill Regulations in the Pe Ell SMP.)

Subsection 173-27-060(2) of the Washington Administrative Code spells out the circumstances when shoreline permits are not required for federal agency actions. It is important to note, however, that even if permits are not required, the proposal must be consistent with the policies and provisions of the Shoreline Management Act and the local Shoreline Master Program.

Any development proposed on a Shoreline of Statewide Significance must be consistent with the use preferences in Section 20 of Chapter 90.58 RCW (Shoreline Management Act of 1971). The application should clearly demonstrate that the project:

- 1) Recognizes and protects the state-wide interest over local interest
- 2) Preserves the natural character of the shoreline
- 3) Results in long-term over short-term benefit
- 4) Protects the resources and ecology of the shoreline
- 5) Increases public access to publicly owned areas of the shorelines
- 6) Increases recreational opportunities for the public in the shoreline.

The information necessary to complete an application for a shoreline permit are listed at 173-27-180 of the Washington Administrative Code. A permit or determination of consistency may not be issued until this information has been received. Of particular concern with this project are the upstream and downstream impacts to and from tributaries to the Chehalis. Especially troublesome is the lack of analysis of the impact of the significant filling occurring within the floodplain of the Newaukum River.

Response: *Currently the Corps does not require shoreline permits but is required to follow the guidelines to the maximum extent practicable.*

Comments related to known and suspected hazardous waste sites, underground storage tank and leaking underground storage tank sites, and facilities that generate hazardous substances:

Page 13-14: If waste were found during construction of the preferred alternative, the DEIS states that the site would be remediated. Who would do the remediation is unclear. The Army Corps? EPA? Washington State? That should be made clear. Certainly, if waste materials are found during construction of a levee, my expectation is that the Corps and their contractors would have to deal with it. EPA or Ecology could help with the follow-up, but the initial work would have to be done by the Corps so they can try to remain on schedule.

Response: *Per ER 1165-2-132 U.S. Army Corps of Engineers Hazardous, Toxic and Radioactive Waste (HTRW) Guidance for Civil Works Projects, if suspected hazardous waste is discovered during construction, the Corps is responsible for conducting a site characterization analysis. If the Corps determines that the site is a hazardous waste site, then responsibility for the site is turned over to the local sponsor. The local sponsor is responsible for additional analysis that may be required and for any remedial action. All site characterization and remedial work must be completed prior to continuing construction at that location. A contingency plan will be included in the Project Work Plan to cover for such an event.*

Page 96: The DEIS mentions several (3 or 4) contaminated sites with groundwater contamination. There are other sites in the study area that are not mentioned on that list with groundwater contamination, such as various LUST (Leaking Underground Storage Tank) sites.

In the electronic copy of the DEIS, it identifies Appendix D (Hazardous Toxic, and Radioactive Waste), but it is not included. I assume the appendix includes the large map prepared by the Corps of the study area and all the waste sites on it. IF not, it should. The map identifies the following types of known facilities: hazardous waste generators; LUST facilities; state cleanup sites; Superfund cleanup sites; Toxic Release Inventory sites, and Voluntary Cleanup sites. One class of sites not included on the map, but mentioned in the text of the DEIS, are both underground storage tank (UST) sites and above ground storage tank (AST) sites. Should these types of tanks be impacted by levee construction or flooding, those are likely to cause contamination. I believe the Corps has Ecology's list of UST sites. To the best of my knowledge, Ecology does not maintain a list of ASTs. EPA might or certainly, the local fire departments should because of their potential threats to public safety. I believe above ground fuel tanks are permitted by the local building departments and/or fire departments.

Response: *The appendix contains a map of the project area, a list of all regulated sites (federal, state, USTs, LUSTs, etc), and a report from the preliminary assessment. A large map of the project area with all known sites has been added as an attachment. Regarding the ASTs, neither the local Centralia fire department nor the Centralia and Lewis County Emergency Management agency have a list of ASTs in the project area. Site inspections did reveal a few ASTs in the project area, but it was determined that they were either sufficiently flood protected or would not be affected by the project.*

Other Permit Comments:

Specific permits may be required before actual construction begins on any phase of the project. A water quality certification may be required from the Department of Ecology in conjunction with the U.S. Army Corps of Engineers' permit for this project.

Response: *Correct, and those permits will be obtained at the appropriate time.*

General Comments:

It is interesting that the preferred alternative is a combination of a project that was authorized previously and the focus project of a previous study (Page 3 - Section 1.3.1.1; page 16 - Section 2.1.2; page 29 - Alternative 4 description, third paragraph).

To minimize impacts on the floodplain, and to help mitigate for the effects of past filling in the floodplain, it would be a positive thing if the source of fill for the setback levees is the floodplain within the project boundaries.

Response: *This will be considered in design.*

Comments with specific text citations:

Executive Summary, page iii, 2nd paragraph “Habitat conditions for fish and wildlife in the Chehalis Basin are limited by several factors, including...This DEIS describes seven different alternatives that were investigated to address those limiting factors while reducing flood damage to the basin.”

This statement implies that factors limiting habitat for fish and wildlife are the first priority, which is clearly not the intent of the project. This is clear in several other statements in the DEIS (Executive Summary, page vi 2nd paragraph; Page 1-Section 1.2 are just two examples).

Page 17 - Section 2.1.4 “Therefore, development of a new floodplain management plan was considered a part of each action alternative”; page 52 - 1st paragraph “These actions will be included in the revised floodplain management plan for the project. This plan will be completed prior to the signing of the cooperative agreement for project implementation.”

Thank you for assuring that revised floodplain management plans will be completed prior to signing the cooperative agreement for project implementation. We assume that no work on project implementation can occur until the revised floodplain management plan(s) are done.

Response: *Although this is not the intent of the project it is, however, a very important decision making factor that carries considerable weight in the decision making process for alternatives. Correct, no work on the project, (i.e., construction) will start until the new plan is done.*

Page 18 - 1st paragraph “the criteria are in no order of priority; each was considered equally important for meeting the project purpose.” and Page 21 - Criteria 9 “A requirement of each alternative is that it be evaluated on the feasibility of incorporating appropriate fish and wildlife habitat measures.”

The evaluation of alternatives that follows these statement frequently fails to mention whether an alternative meets, or does not meet, this criteria. Other criteria (usually #1, 2, 5, 6 and 7) are

almost always mentioned in this section, leading one to conclude that the evaluation is skewed. This is reinforced by the fact that none of the alternatives meet all criteria but somehow the alternatives that meet some criteria, but perhaps not #9, are selected for further evaluation. Examples of this include: Page 22 - Alternative #1 (no mention of not meeting criteria #9); page 23 - Alternative #2 (again, no mention of criteria #9); page 28-29 - Alternative #3 (apparently only looks at criteria #9 for one bypass, the SR-6 Bypass; page 30 - Alternative #4, bottom of the last paragraph "Setting the alignment away from the river's edge may also allow opportunities for environmental restoration (doesn't address criteria #9).

Response: *Alternative 1 could not meet any of the criteria as stated and therefore Criterion 9 was not listed. Alternative 2 should have had the statement that it does not meet Criterion 9 as a stand-alone alternative. Alternative 3, the alignment away from the river's edge does in fact meet Criterion 9 as stated in the sentence previous to the above-mentioned sentence, "additional studies will be required". Anytime the project can be kept away from the river's edge, an environmental benefit is gained by not having a direct impact to the riparian areas.*

Page 34 - 2nd paragraph "Although Alternative 5 met some of the project criteria, none of the design options could reasonably meet all of the criteria. Alternative 5 was therefore dropped from further evaluation."

This same thing could be said about all seven of the Alternatives (none could reasonably meet all of the criteria). This reinforces that not all the criteria are considered "equally important for meeting the project purpose."

Page 45 - 2nd paragraph "However, many of the non-structural features of Alternative 7 **would be** incorporated in any alternative identified as the preferred alternative. Non-structural measures that **would not be** specifically included....but, which **could be** undertaken by local jurisdictions... The local jurisdictions **would adopt**..."

First, please identify those non-structural features that would be incorporated in any alternative identified as the preferred alternative versus those that could be undertaken by local jurisdictions. Second, what control does USGS have over the adoption of the new FEMA 100-year floodplain maps?

Response: *The non-structural features from Alternative 7 that are incorporated as part of the preferred alternative. These include (1) elevation of structures, (2) definition of a new 100-year FEMA floodplain, (3) appropriate improvements in the flood warning system, (4) restriction of development in floodways and other critical floodplain areas, (5) restriction of filling in the floodplain, and (6) appropriate improvements to local stormwater management plans. As stated in Section 2.5.3, the local sponsor will implement the listed actions to the maximum extent possible; the actions will be included in the revised floodplain management plan that is required by E.O. 11988 for the project to be constructed. The Corps will review and approve the revised plan to ensure that the non-structural project components are appropriately incorporated into the plan, and will provide technical support to assist in development of non-structural features to assure the integrity of the project structural components. The elevation of structures is included*

as part of the cost-shared project. Eight homes showed to be economically justified for flood protection through elevating the structures.

Page 53 - middle paragraph “A new 100-year FEMA floodplain map will be generated...The communities will adopt this map.

What will happen if they don’t adopt the new 100-year FEMA floodplain map?

Response: *The local communities can choose to adopt a new map based on the draft mapping prior to FEMA completing the final mapping and approval process. After FEMA has completed the new floodplain map, no adoption is required.*

Page 57 - Section 2.6 “Incorporating appropriate fish and wildlife habitat restoration measures to the maximum extent practicable is one of the defining criteria of the project and consistent with the Corps mission for environmental sustainability.”

It seems that most of the other criteria rely on some form of cost/benefit analysis and yet the success of the criterion relating to habitat is measured by general statements such as “to the maximum extent practicable.” How can you possibly compare one criterion with a cost/benefit analysis to another criterion that will be implemented “to the maximum extent practicable?” How do you define “To the maximum extent practicable?”

Response: *This is defined and based on what impacts a particular alternative would have and what would be required to either mitigate or, if mitigation is not required, what restoration could be accomplished to enhance the environment.*

Page 58 - 2nd paragraph (under Section 2.6 Potential Restoration Sites) “Each of the potential restoration measures is conceptual at this point and may be altered, eliminated, or combined with others as more detailed design studies are conducted.”

This language could lead to the conclusion that very little actual potential restoration is guaranteed. At least make a commitment to a certain dollar amount or percent of the project budget that will be spent on restoration.

Response: *We are unable to commit to a percentage or dollar amount for restoration. Restoration is above and beyond what would have to be mitigated for. Restoration depends on the funds the sponsor has, obtainable real estate, and size of the restoration project.*

Page 84 - bottom of the last paragraph

Please clarify that only the water quality criterion for dissolved oxygen is relaxed, and it is only relaxed for the period from June 1 to September 15.

Response: *The sentence was edited to include the timeframe mentioned.*

Page 85 - last paragraph “The Centralia reach is a natural sill in the river...”

More accurately, the Centralia reach is caused by a natural sill.

Response: *The sentence in question was edited to reflect this information.*

Page 89 - second paragraph

The City of Centralia is no longer just proposing to build a new WWTP-- they are constructing a new one. In addition, it is not being built with the capacity necessary to serve as a regional facility. That capacity would have to be added later.

Response: *The sentence in question was edited to incorporate this information.*

Page 90 - last paragraph

The Temperature TMDL was approved by EPA in December of 2001

Response: *The sentence in question was edited to incorporate this information.*

Page 169 - 1st paragraph of Section 4.1.3.1 and page 176 Section 4.3.3.1

Any construction project disturbing more than 5 acres is required to have a site-specific stormwater pollution prevention plan. This plan must be available onsite and followed during construction.

Response: *Comment noted. A SWPPP will be prepared for the project and followed throughout project construction.*

Page 177 - 4.3.5 Summary

This paragraph references a section (4.13) that does not appear to relate to the text of this section. Is this a typo?

Response: *The typographical error has been corrected.*

Page 179 - Vegetation Impacts

Mitigation for vegetation impacts could include riparian planting of tree species that would provide a positive shade benefit over time. This would help meet the intent of the temperature TMDL for the Upper Chehalis River.

Response: *The Corps agrees that planting of tree species could provide shade benefit over time and help with the temperature issue. However, we must look at this as restoration as we are mitigating for the loss of wetlands and not vegetation.*

Page 180 - 2nd paragraph

This is probably stated somewhere else in the DEIS, but who is responsible for maintaining the levees once they are constructed?

Response: *The local sponsor will be forming a diking district/flood district.*

FINAL US FISH & WILDLIFE COORDINATION ACT REPORT FOLLOWS ...



June 2003

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Colonel Ralph H. Graves, District Engineer
Corps of Engineers, Seattle District
Attn: Beth Coffey
P.O. Box 3755
Seattle, Washington 98124-2255

Dear Colonel Graves:

Subject: Final Fish and Wildlife Coordination Act Report for the Centralia-Chehalis Washington General Reevaluation Report (Centralia Flood Study)

Enclosed are five copies of our final Fish and Wildlife Coordination Act report (CAR) on the Centralia-Chehalis Washington General Reevaluation Report (Centralia Flood Study). It is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661, *et seq.*) and fulfills Section 2(b) of this Act.

We have been actively involved in the alternative formulation and selection process, review of technical documents, and planning of mitigation and restoration elements. We have closely coordinated with other resource agencies, including the Washington State Department of Fish and Wildlife (WDFW) and Chehalis Indian Tribe. We provided the WDFW and the tribe with copies of our Draft CAR and received verbal comments, which we have incorporated into this final document. We provided the Corps with our draft CAR prior to issuance of the draft EIS. We have revised our final report to reflect the Corps' comments as presented in draft EIS.

We appreciate the direction the Corps has taken with this project and the coordination done in selection of the least environmentally damaging alternative. We support the concept of the setback levees. However, the short planning timeline for this project has meant that many details we had hoped would be finalized by now are yet to be developed.

First, we are concerned about how well nonstructural measures will actually contribute to the protection of natural flood plain functions on the river side of the levees. If nonstructural measures do little to restrict further commercial development and fill of the flood plain, then one of the major benefits of the setback levee approach—natural flood plain function—would be limited.

Second, the Corps has not coordinated with resource agencies and tribes to determine the adequacy of mitigation to compensate for project impacts. The Corps has proposed the SR-6/Scheuber Ditch mitigation project, which we support, but has not demonstrated that it alone is

sufficient as mitigation. In addition, many details remain to be developed about how this mitigation project would function.

Third, we do not yet know specifics about the impacts that could occur from altering flows in the Skookumchuck River, nor are we certain about how these would be mitigated. We would not support mitigation for those impacts in a different basin. The Corps has indicated that geomorphic and sediment studies will commence during the next phase of planning to help determine the significance of these impacts in the Skookumchuck River. As of yet, we have not participated in the scoping or planning of these studies.

Fourth, although the project purpose identifies habitat enhancement as an important part of the project, the Corps has not selected any restoration projects above and beyond the SR-6/Scheuber Ditch mitigation proposal. It has not indicated that it will undertake additional restoration.

Finally, the Corps has not yet discussed details about monitoring and adaptive management with our agency or other resource agencies. This is a huge project with many potential impacts. Assumptions have been made about the magnitude of impacts that we are not certain are correct. The short timeline has meant that many contingencies have not been well thought out. A few years from now, we may discover that the project needs to be operated differently for flood control, or that mitigation sites are not functioning well, or that impacts are much greater than predicted. We need to have the ability to take corrective actions should they be necessary.

We want to make sure that the issues described above are addressed with sufficient detail and clarity to alleviate our concerns about potential impacts. Accordingly, we are recommending that the Corps convene a mitigation workgroup, composed of the U.S. Fish and Wildlife Service, affected resource agencies and the tribes, to participate in the development of these plans and studies. Our support for the proposed project will depend upon the quality of the plans described above, the commitment to their implementation, and the degree to which the Corps coordinated with others while developing them.

Thank you for the opportunity to work with you and your staff on this project. For further information, please contact Lou Ellyn Jones at 360-753-5822 or Lynn Childers at 360-753-5831.

Sincerely,

Original signed by Lynn P. Childers

Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

cc:

WDFW, (Olds)
WDOE (Sokal)
WSDOT (Park)
Chehalis Tribe (McGinnis)
EPA (Clark)

U.S. Fish and Wildlife Service

FINAL

Fish and Wildlife Coordination Act Report

**CHEHALIS, WASHINGTON, GENERAL RE-EVALUATION REPORT
AND ENVIRONMENTAL IMPACT STATEMENT**

**Prepared for
U.S. Army Corps of Engineers
Seattle District**

December 20, 2002

**Prepared by
Lou Ellyn Jones, Biologist
U.S. Fish and Wildlife Service
Western Washington Fish and Wildlife Office
Lacey, Washington**

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INTRODUCTION

For over a century, urban, residential and road development within the Chehalis River floodplain in and near the cities of Centralia and Chehalis, Lewis County, southwest Washington State, has increased risk from flood hazard. In recent years, flooding was severe in both of these cities and closed Interstate Five (I-5) on several occasions. In addition to flooding, the Chehalis Basin ecosystem is degraded and populations of anadromous fish have declined. The southwest Washington population of coastal cutthroat trout is a species of concern and coho salmon is a candidate species under the Endangered Species Act. The U.S. Army Corps of Engineers proposes a setback levee system and modifications to the Skookumchuck Dam as the most feasible solution to flood problems. Included with the project proposal are nonstructural measures to reduce the risk of flood hazards.

This Fish and Wildlife Coordination Act Report (CAR) presents the U.S. Fish and Wildlife Service's (Service) conclusions on the benefits and adverse impacts to fish and wildlife expected to occur if the proposed action goes forward. This CAR is provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661, et seq.) and fulfills Section 2(b) of this Act.

This report is based on our participation in the planning and development of the proposed project since scoping began in September 1999. Our staff also participated in the planning of a Corps project authorized in 1986 to raise the Skookumchuck Dam for flood control. That project did not go forward because it was found to be economically infeasible. The current project re-evaluates modifications to the 1986 authorized project.

The local sponsor and the Corps initially indicated a goal of obtaining Water Resources Development Act (WRDA) 2002 funding. The short time line implied by this goal has driven the alternative selection process and influenced decisions along the way. Our involvement has focused on encouraging the Corps to select a preferred alternative that would have the least environmental impacts.

We have been actively involved in the alternative formulation and selection process and review of technical documents. We expect to be involved in planning mitigation and restoration elements. We were not provided with the opportunity to participate in the scoping and implementation of the fish and wildlife habitat study (PIE 2001), although we provided comments once it was completed. This report is based on documentation provided by the Corps, on studies and reports done prior to or in conjunction with the feasibility study, and on field investigations, discussions with technical specialists, and literature reviews conducted independently. During our participation, we have coordinated closely with and obtained information from the Washington State Department of Fish and Wildlife (WDFW), the Chehalis Indian Tribe, the Washington State Department of Ecology, and the Environmental Protection Agency. We provided the Chehalis Indian Tribe and the Washington State Department of Fish and Wildlife with copies of our Draft CAR. We have received verbal comments about the report, which we have incorporated into this final version. We provided the Corps with our draft CAR

prior to issuance of the draft EIS. We have revised our final report to reflect the Corps' comments as presented in draft EIS.

Corps authority for this project includes the authorization of the Skookumchuck Dam Modification Project under Section 401(s) of the 1986 Flood Control Act (PL 99-662), the project that was dropped. In 1998, Congress adopted Resolution 2581, authorizing the Corps to determine whether the recommendations made under the previous study should be modified "with particular reference to flood control and environmental restoration and protection, including nonstructural floodplain modification."

PROJECT LOCATION AND SETTING

The Chehalis River Basin, in southwestern Washington State, is the second largest watershed in the state, draining approximately 2,660 square miles (Chehalis River Council 1992) (Figure 1). The basin includes Water Resource Inventory Areas (WRIAs) 22 and 23. Only the Columbia River basin is larger.

From its headwaters in the Willapa Hills in eastern Pacific County, the Chehalis River flows east (Figure 2). It turns abruptly north near the city of Chehalis, where it is joined by the Newaukum River. Downstream, at the confluence with the Skookumchuck River and near the city of Centralia, the river trends northwest and begins to drain the South Puget lowlands. The river then flows primarily to the west, draining the southern Olympic Range and finally emptying into the Pacific Ocean via Grays Harbor.

The project area is approximately in the middle of the upper Chehalis River Basin (WRIA 23), an area draining 1,294 square miles and defined as all waters passing the stream gauge at the town of Porter (Wildrick et al. 1995). Vegetation type in the basin is largely westside lowland conifer/hardwood forests as described by Johnson and O'Neil (2001) with a primary land use of forestry. Land ownership in the basin is largely private, with smaller areas of state, federal and tribal ownership (Figure 3). The Upper Chehalis River basin spans five counties: Lewis (60%), Thurston (24%), Grays Harbor (11%), Pacific (4%), and Cowlitz (1%).

The project area encompasses the cities of Centralia and Chehalis and is bisected by Interstate Five (I-5) (Figure 4). Land use includes forestry, agriculture, low density residential, and urban development. Development is occurring along the I-5 corridor, especially in Thurston County.

Figure 1 Chehalis Basin WRIAs 22 and 23

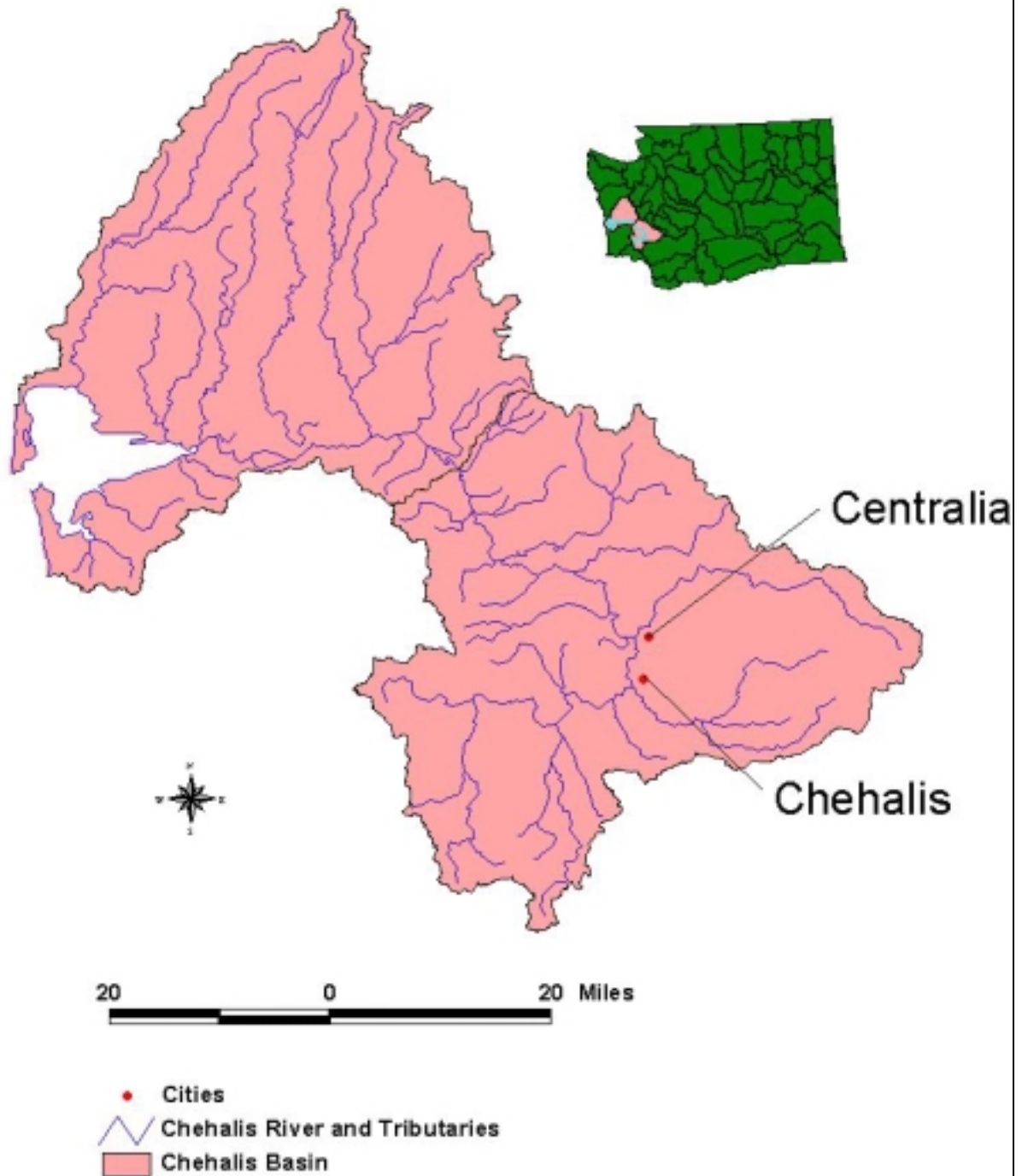


Figure 2 Upper Chehalis Major Tributaries



0 20 Miles

- Chehalis Tribal Reservation
- Skookumchuck Reservoir
- Cities of Centralia and Chehalis
- Chehalis River and tributaries
- Upper Chehalis Basin



**Figure 3 Upper Chehalis
Land Ownership and Sub-basins**

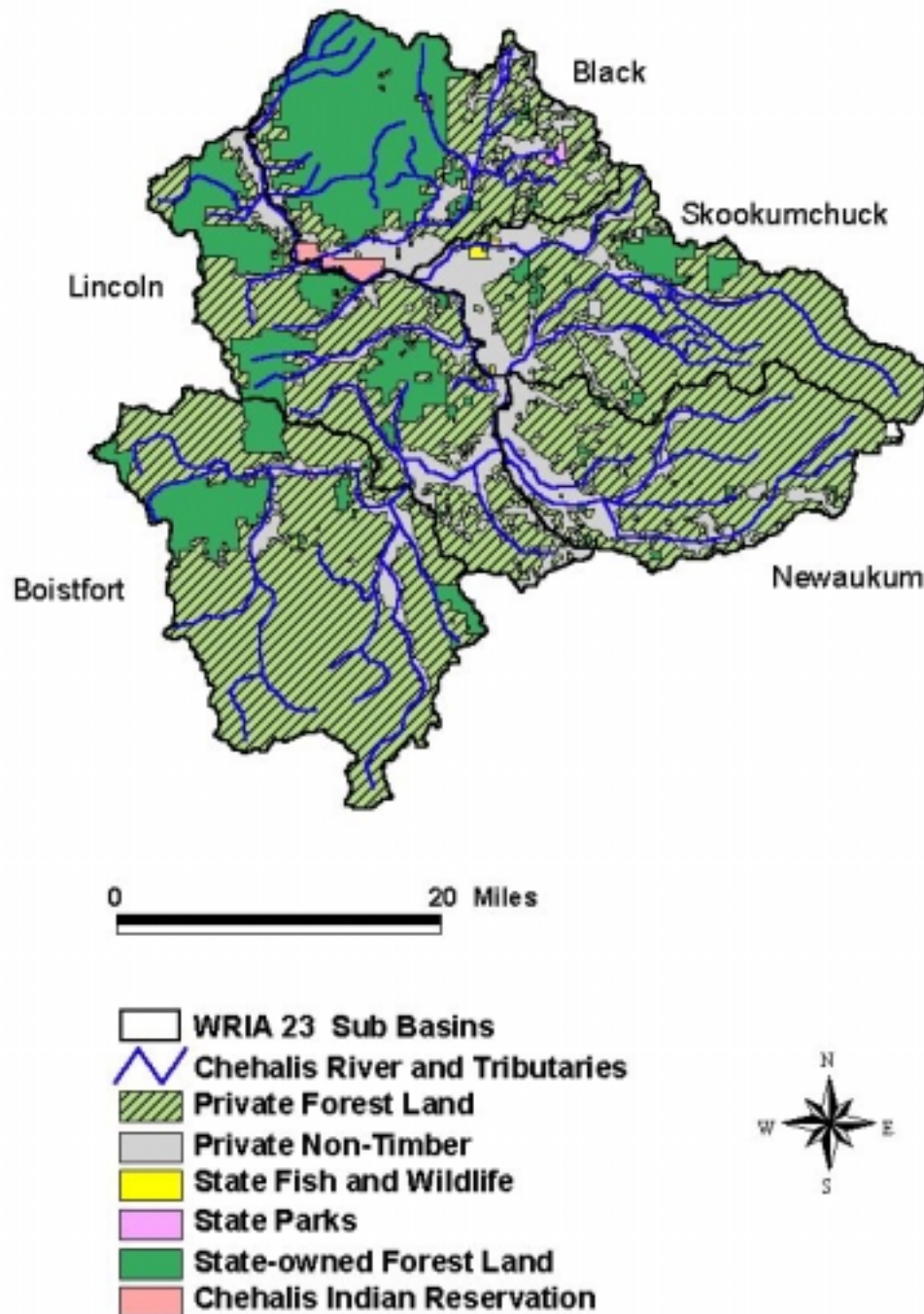
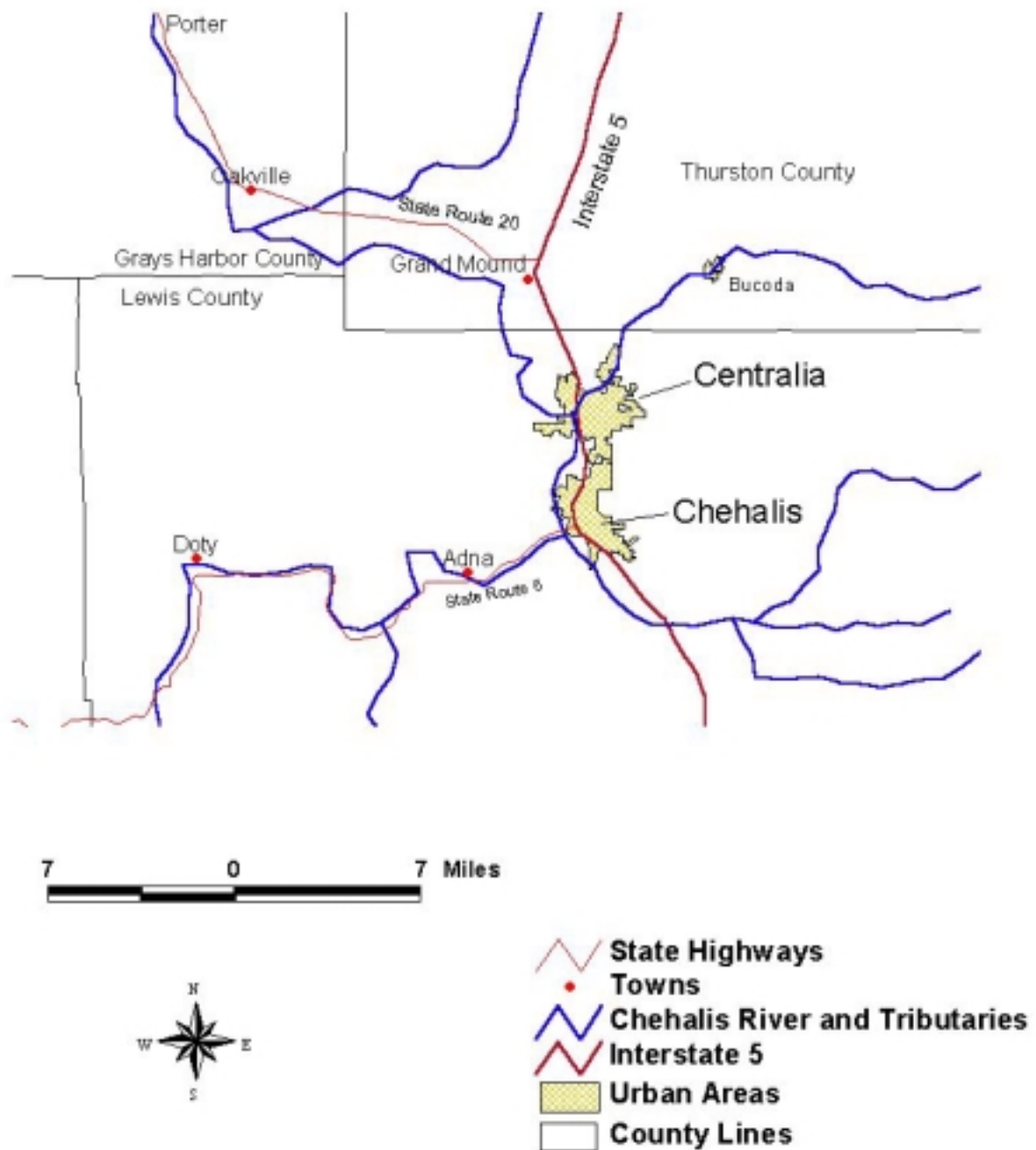


Figure 4 Project Area



The Corps has identified the project area to include the Chehalis River main stem from Oakville (RM 47) near the Chehalis Indian Reservation upstream to Pe Ell (RM 100), and including portions of the Newaukum and Skookumchuck Rivers and Salzer Creek. The project area extends to the Skookumchuck Dam (RM 7.5) and includes the reservoir. The Skookumchuck River originates from the west slope of the Cascade Mountains, draining an area of approximately 183 square miles. Upstream of the Skookumchuck Dam, the sub-basin is hilly and in forestry land use. Downstream of the dam, the river enters a broad, flat valley and land use is primarily agriculture and rural residential. The confluence with the Chehalis River is at the city of Centralia.

CLIMATE AND HYDROLOGY

The Chehalis Basin lies in the Pacific Coast Ecoregion, west of the Cascade Mountain range in Western Washington as described by Naiman and Bilby (1998). The climate is typical of the Pacific Northwest maritime region, with cool, wet winters and warm, dry summers. Some parts of the basin capture more precipitation than others. The Willapa Hills, for example, average more than 120 inches of rain per year, while the cities of Centralia and Chehalis average only 40-50 inches per year. Peak flows in the sub-basins are variable depending upon rainfall, hill slope, and vegetation characteristics.

Most of the rainfall in the upper Chehalis basin occurs from October through May; December is the wettest month, and July and August the driest (Wildrick et al. 1995). Compared to more northerly rivers that derive much of their annual discharge from snowmelt, the Chehalis Basin is rain driven. This means that a high proportion of annual discharge occurs during the first three months of winter compared to snow melt basins where flows are highest during spring and early summer from the melting snow pack. Although large amounts of snow fall occur periodically in the upper tributaries and the headwaters, this is not usually a significant factor in the timing or magnitude of stream flows in the Chehalis (Wildrick et.al. 1995).

GEOLOGY AND TOPOGRAPHY

Continental glaciation during the Pleistocene period has strongly influenced present day geology and hydrology in the project area. Areas of the Skookumchuck River downstream of the dam and the upper South Fork Newaukum River have enormous quantities of both porous gravels and sands (outwash), that washed off the glacier as it was melting, and relatively impermeable hardpan (till) (Cherry 2001). The south and southwestern part of the basin is underlain by bedrock with a volcanic or marine sedimentary origin. Over time, fluvial and/or glacial deposits collected in the stream valleys over this bedrock. Streams then eroded these deposits to form a characteristic series of benches and terraces that get successively narrower and younger as they approach the river (Weigle and Foxworth 1962). The older terraces have eroded into a rolling, foothill appearance.

Alluvial and glacial deposits in the valley bottoms are usually no more than 100 feet deep and constitute surficial aquifers. These aquifers form a hydraulic connection between ground water

and surface waters and provide base flows for the Chehalis River and its tributaries during dry months (Wildrick et al. 1995).

Topography is gentle, with elevations ranging from 3,600 feet in the upper Skookumchuck Sub-basin to 150 feet in the “Centralia Reach,” that portion of the river between the cities of Chehalis and Centralia. From its source, the main stem is steep, with a gradient of 16 feet per mile, flattening to 1 foot per mile at the confluence with the Skookumchuck River (Tetra Tech 2001). The river in the Centralia Reach is sinuous and the floodplain is broad with numerous oxbow lakes and meander scars.

PROJECT BACKGROUND

A significant amount of state and federal funding has been spent in the upper Chehalis basin to reduce flood hazard and to restore habitat for salmonids. Although initially configured solely as a flood risk reduction project, the Centralia Flood Study includes as part of its project purpose to “incorporate appropriate fish and wildlife habitat improvements.”

In 1986, Congress authorized the Corps to construct “works of improvement” that would reduce flood damages in the Skookumchuck Valley, the city of Centralia, and the town of Bucoda. The authorized project was to modify an existing, private, water supply dam on the Skookumchuck River to provide extra flood storage. The project was subsequently dropped because it could not be justified economically.

Severe floods occurred in 1990 and 1996 that caused damage to the cities of Centralia and Chehalis and closed I-5 to traffic. According to the Corps, the closure of I-5 for three days caused a severe economic loss to the region. The local project sponsor, Lewis County, contracted with Pacific International Engineering (PIE) to identify modifications to the 1986 authorized project (the dam raising proposal) that might result in a more cost-effective project, taking transportation delays into account. This proposal, called the “Lewis County Alternative,” was detailed in a Draft Interim Report (PIE 1998). That report proposed several variations of an alternative that would raise the dam, excavate a 2.5 million cubic yards flood bypass channel near the Mellon Street Bridge and use the resulting fill to construct a 1.5 mile long berm in the floodplain to divert flood waters. In 1998, Lewis County requested the Corps to resume design work on the originally-authorized project with PIE’s proposed modifications. In 1998, Congress authorized the Corps to re-evaluate the authorized project along with other alternatives that would address flooding and environmental problems.

Degradation of salmonid habitat in the Chehalis River Basin has been a concern for years, and both state and federal funds have been used for restoration purposes. In 1990 Congress authorized the Chehalis River Basin Fishery Resources Study and Restoration Act. Under this authority, habitat degradations were studied throughout the Chehalis Basin (Wampler 1992), and Congress later recommended funding restoration projects through the Chehalis Fisheries Restoration Program, to be conducted by the U.S. Fish and Wildlife Service. Although Congress originally recommended \$1 million per year, the program has consistently received only about \$200,000 per year for restoration projects. In 1999, Puget Sound chinook salmon and Coastal

Puget Sound bull trout were listed as threatened under the federal Endangered Species Act. As the result of these listings, Washington State initiated a number of actions to restore salmonid habitat, including watershed planning, analyses of factors limiting to salmonids in various watersheds, and funding for restoration projects.

Although chinook salmon are present throughout the Chehalis basin, this population is not listed under the ESA. Bull trout have been observed in the lower Chehalis Basin but it is unknown whether they occupy the upper basin. Southwestern Washington populations of coho salmon, present throughout the basin, are candidates for listing.

As the Corps began its planning process in 1998, resource agencies and other local jurisdictions raised concerns about the momentum of the “Lewis County alternative” and the failure of the process to develop less environmentally-damaging alternatives that could also meet the project purpose. Accordingly, the Washington State Legislature provided funds for the Washington State Department of Transportation (WSDOT) to form an interagency workgroup that would develop an alternative that met a wider range of stakeholder needs. That workgroup, formed of resource agencies, local governments, citizen groups, and tribes, developed the “Interagency Alternative,” a sequential process that assessed the benefit of nonstructural measures to reduce the risk of flood hazard before considering structural solutions. With input from this interagency workgroup, the Corps formulated several additional alternatives and measures to consider as part of its re-evaluation study.

In a related effort, the Corps has partnered with Grays Harbor County to assess historic and existing conditions of the Chehalis River basin in order to provide ecosystem restoration and ancillary flood damage reduction benefits throughout the basin. This Ecosystem Restoration General Investigation (GI) study, which we will refer to in this report as the Chehalis Basin Study, was authorized in 1999. It grew out of the conviction by the Corps, resource agencies and local communities that some of the local flooding and erosion problems in the basin were related to ecosystem degradation. It was assumed that a Corps project that addressed restoration on a grand scale would address some of the degradation and help salmonid populations. At the same time, local flooding problems might be decreased. Through our involvement with the flood project, we evaluated many restoration activities that would be appropriate for implementation by the broader study.

As part of its statewide proposal to widen I-5, the Washington State Department of Transportation (WSDOT) planned to raise the grade of I-5 near the cities of Centralia and Chehalis to prevent flooding. Because a Corps flood project would eliminate the need to raise I-5, WSDOT has provided local cost share for the project, although Lewis County remains the local sponsor. Protecting I-5 has been an important element in providing economic justification for the project.

BACKGROUND ON THE SKOOKUMCHUCK DAM

Skookumchuck Dam, built in 1970, is owned by a consortium of public and private utilities. PacifiCorp operates the dam to provide water to the 1,400 megawatt Centralia Steam Electric Plant and supplement flows to benefit fish. The dam operates so that the reservoir fills each year

with the first heavy rains in the fall and allows subsequent inflow to spill over the dam until the reservoir level drops down again due to decreasing inflows.

The 540 acre reservoir holds 38,700 acre feet of water between the normal minimum pool elevation at 400 feet to the spillway crest at elevation 477 feet mean sea level. The dam is an earth fill structure approximately 190 feet high with a crest at elevation 497 feet. During storm events, the flows top the spillway, however, there is limited capacity to release water once the pool elevation drops below 477 feet.

Water discharge from the dam depends upon pool elevation. Three intake structures at elevation 449, 420, and 378 lead to an outlet works consisting of two concrete encased steel pipes cut in rock under the dam. Outlet capacity, controlled by two 24 inch Howell-Bunger valves, is from 150 - 220 cfs. As the pool rises and reaches the level of each intake, outflows adjust on a continuum from 95 cfs with one intake submerged, 140 cfs with two intakes submerged, and 220 cfs with all three intakes submerged. Once the reservoir is filled, water is discharged both from the outlet works and over the spillway. Outflows from the dam average from 95 cfs to 1200 cfs, depending upon the month, with flows during a 100 year event reaching as high as 7,425 cfs.

Steelhead spawners are captured and hauled upstream of the dam but there is no other upstream fish passage. It is assumed that downstream migrants, including steelhead juveniles, smolts, and adults, and resident cutthroat trout, survive passage over the spillway or through the three outlets. However, we have seen no studies to confirm or deny this. We are uncertain whether the intake to the power generation facility has fish screens to prevent fish from being drawn into the turbines.

The three outlets allow water temperature below the dam to be maintained at less than 60 degrees for fish. Part of that water is used in a fish rearing facility owned by the Washington Department of Fish and Wildlife (WDFW) about 0.5 miles downstream of the dam.

The dam owners and the Washington State Department of Fisheries initially developed a fisheries agreement to set flow and temperature standards for fish, formalize dam operations that affect fish, and set hatchery operation to mitigate for fish habitat lost due to construction of the dam. A revised Skookumchuck Dam Agreement was prepared February 23, 1999 between PacifiCorp (representing a consortium of public and private utilities that own the Centralia generating plant, the coal mine, and Skookumchuck Dam) and the Washington State Department of Fish and Wildlife (WDFW) revising standards for in-stream flows to aid chinook spawning, flows for drought conditions, water temperatures, and Standard Operating Procedures for the winter steelhead program. There were no provisions for flood storage.

Lewis County and PacifiCorps are conducting negotiations with the current owners for transferring ownership of the dam to a flood control district that will operate and maintain the facility for flood control. We are uncertain whether the power facility at the dam will be decommissioned by the new owners.

PROPOSED ACTION

The recommended plan was developed with guiding principles that included 1) avoiding and minimizing environmental impacts, 2) minimizing initial construction and long-term maintenance, 3) minimizing project-induced damages within the project area and downstream, 4) avoidance of inundating or excavating hazardous materials, 5) maximizing transportation corridor and local infrastructure flood protection benefits, and 6) incorporating restoration opportunities.

The plan consists of several components: 1) a “setback” levee alignment to protect flood-prone areas in Chehalis, Centralia, and the airport, 2) a flood bypass under SR 6 to increase flooding of the floodplain to the north of State Route 6, intended as mitigation for project impacts, 3) operation of the Skookumchuck Dam for flood control, and 4) implementation of nonstructural measures developed by the Interagency Workgroup. Although the Corps had a Draft Restoration Plan prepared (Tetra Tech 2001), we are uncertain whether the Corps intends to incorporate any of these projects as part of the recommended plan.

LEVEE SYSTEM

This component is proposed to protect urban areas and I-5 by upgrading existing embankments and constructing new levees and/or floodwalls along the Chehalis and Skookumchuck River floodplains and tributaries to provide 100 year protection. Our understanding is that the Corps will be constructing 15.4 miles of new levees. We are still uncertain as to where, on the proposed levee alignment, the new versus upgraded levees will be. The Corps has stated that they will produce maps prior to the planning, engineering and design phase (PED) distinguishing the existing levees, where upgrades will take place, versus new levees planned for construction.

The Corps based the levee alignment on a proposal from the 1970s with refinements based on flood observations from the 1990 and 1996 floods. Hydraulic modeling allowed further refinements; for example, some levee segments could be deleted where flood protection was not needed, or better alignments could be found. For the most part, levees will allow the river to inundate the floodplain at small, frequent flood events but protect infrastructure such as residential and commercial structures, and transportation corridors, in more extreme events.

Because the levee system is intended to protect existing infrastructure rather than buildable land, the alternative is not expected to encourage further development of the floodplain. It appears, however, that local land use ordinances could allow some commercial development on the river side of the levees. Levee design was coordinated with WSDOT to ensure consistency with the widening of I-5.

The levee system will extend along the Chehalis River from approximately RM 75 to RM 64, along the Skookumchuck River from RM 5 to the confluence with the Chehalis River, and the lower two miles of Dillenbaugh and Salzer Creeks. The levees will have a 12-foot top width and 2:1 horizontal vertical slope. Where space for the levee footprint is limited, vertical floodwalls will be constructed.

SR-6/SCHEUBER DITCH PROJECT

The SR-6/Scheuber Ditch project is proposed to reduce flood stage in the Chehalis area by constructing a 400 foot flowway under a portion of SR-6 and elevating the roadway to provide clearance so that floodwaters would have better access to the floodplain. The opening would require excavation and grading of 65,000 cubic yards of material. The Corps states that excavated material would be used in levee construction where possible or disposed of in appropriate locations. We are uncertain whether disposal areas will be found outside of the floodplain. Flood flows would enter the floodplain to the north of SR-6 and return to the river at the downstream end of the floodplain storage area. In addition, two railroad openings and flow control boxes on Dillenbaugh Creek would be closed.

The Corps proposed the SR-6/Scheuber Ditch project as mitigation. The plan calls for connection of a large oxbow south of the SR 6 bridge and restoration of a connected wetland complex north of SR 6. Another wetland complex at the north end of Scheuber ditch would be connected to the Chehalis River. Tributaries currently flow into both of the proposed wetland areas. The proposal would include realignment of Scheuber Ditch to resemble a meandering stream, planting a 200 foot riparian buffer, and where possible, removal of agricultural drain tiles. The intent of these features is to provide summer rearing and overwintering habitat for coho salmon, to improve groundwater recharge and hyporheic connections, increase floodplain function, and improve wildlife habitat.

The Corps will develop more detailed plans for this mitigation feature during the PED phase in coordination with the resource agencies and affected Indian tribes. At that time, the Corps will better identify the flows needed for connection with the oxbow and bypass floodway, ways to minimize fish loss due to stranding, entrapment and predation, and anticipated maintenance needs. The local sponsor will be required to purchase in fee the property needed for the mitigation project.

MODIFICATIONS TO SKOOKUMCHUCK DAM

Proposed modifications to the structure and operation of Skookumchuck Dam would be intended to work with the levee system to reduce flood stage in Centralia. Flood control operations involve draw down in the summer through the fall to provide extra flood storage during the winter. The reservoir is planned to be at or below elevation 444 feet by early November, prior to the onset of flood season. Inflow to the reservoir would be passed through the outlet works to maintain the 444 foot pool elevation. The pool height is expected to remain fairly constant during the late spring, summer and early fall, would decrease in late fall, and may have large fluctuations in response to a flood event. Flood events are expected to be relatively short in duration, lasting around 4-6 days.

The current height of the dam is at elevation 497 feet; the crest of the spillway is at elevation 477 feet, providing a flood storage capacity of 11,000 acre feet. Initially, the Corps indicated that the levee with the “low dam” modifications (no increase in pool height above elevation 477 feet) comprised the National Economic Development Plan. Under this option, no additional flood storage would be created by use of a structure on top of the spillway. The levee and the “high

dam” modifications (i.e., use of a weir or gates to allow storage up to elevation 492 feet) comprised the locally preferred alternative.

We have since learned that the “high dam” option allowing an additional storage capacity of 9,000 acre feet will be part of the recommended plan. The spillway would be fitted with a pair of slide gates that would increase the maximum pool rise to elevation 492 feet.

Under the “high dam” alternative, the slide gates would not retain water at the higher pool elevation for longer than five days and would not be used more than once every other year. The Corps has stated that the gates, if constructed, would only be used for flood storage, and that they would only be used for a 70 year event, coming into full capacity at a 100 year event.

During a storm event, outflow from the dam will be controlled so that flow at the Pearl Street river gauge in Centralia does not exceed 5,000 cfs. Water would continue to be released after the storm event to lower the reservoir elevation and maintain flows at the Pearl Street gauge below 5,000 cfs.

During non-flood times, flows should continue to follow the patterns recorded at the Bloody Run gauge downstream of the dam. Flows at this gauge range from a low of about 100 cfs in the late summer to a mean monthly flow in late winter of 1,000 cfs to 3,000 cfs. The project proposes to continue operations under the fisheries agreement with the addition of more specific criteria for ramping rates for routine operations and times of flood control or spawning periods. Discharges would meet temperature requirements and meet or exceed existing minimum, in-stream flows. (See the Corps draft Skookumchuck Dam Fisheries review dated April 25, 2002).

NONSTRUCTURAL MEASURES

Some of the nonstructural elements discussed in the DEIS, such as elevating existing structures within the levees and a flood warning system, will provide flood hazard reduction with little environmental impact. For the protection of fish and wildlife habitat, the nonstructural measures need to also discourage continued urban development of the floodplain. The nonstructural measures that are most important in protecting a naturally-functioning floodplain include the following:

- 1) Adoption of a new regulatory 100 year floodplain map for use by the local communities in land use planning. This map would be an update of the existing FEMA map and would more accurately show the extent of flooding in the last few decades. The Corps states that the local communities will adopt the new floodplain map once FEMA has accepted that the proposed flood project will be completed. We are not certain of the time line for this to take place.
- 2) Restrictions or a moratorium on residential, commercial and industrial development in the newly defined floodway and flowpaths. During the PED phase of planning, the Corps will provide local governments, i.e., Lewis County and the cities of Centralia and Chehalis, with information on the post-project floodway and flowpaths, designations which will guide land use decisions. Two of the local jurisdictions, Lewis County and the

City of Chehalis, currently allow commercial development in the floodway provided it would not increase flood levels during a 100 year event. Our understanding is that this policy would not change appreciably post project. We are not certain whether development would be allowed on the river side of the proposed levees and if so, how extensive this might be in the future.

3) Restriction of fill in the floodplain (i.e., implementation of a “no net loss” policy for the capacity of the newly defined floodplain). In the DEIS, the Corps describes what a “no net loss” policy would be and how it might be implemented in a Comprehensive Flood Hazard Management Plan for Lewis County. However, we are uncertain whether the local sponsor intends to develop such a policy. According to information provided by the Corps, all three local jurisdictions have policies regarding fill in the floodplain, floodway or flood fringe. We are not certain to what extent these existing policies meet the intent of the recommended “no net loss” policy.

4) Development of a floodplain management plan consistent with the Executive Order on Floodplain Management, 11988. The Corps states that nonstructural measures that are part of the preferred alternative will be implemented to the maximum extent practicable by the local sponsor. The actions will be detailed in a revised floodplain management plan for the project, to be completed prior to signing of the cooperative agreement for project implementation. The Corps will work with the local sponsor to ensure that nonstructural actions support the integrity of the project’s structural components. The floodplain management plan will be developed during the PED phase of planning.

MITIGATION AND RESTORATION

Earlier in planning, the Corps provided us with a draft restoration plan that lists types of restoration “opportunities” that could be used to enhance fish and wildlife habitat (Tetra Tech 2001). We participated in the development of this conceptual plan (see Evaluation Methodology). At the time these were developed, no one was certain which alternative or combination of measures would be selected by the Corps as a recommended plan. The Corps and resource agencies generally agreed about the types of impacts expected to occur from various alternatives but we had no specific information about the magnitude of those impacts or how they should be mitigated. We assumed at that time that the “opportunities” would probably be appropriate as compensatory mitigation for certain types of impacts or as restoration projects to improve fish and wildlife habitat. To date we have not seen a mitigation plan, nor a determination of what specific restoration projects would be included as part of the proposed project.

Since we issued the draft CAR, the Corps has clarified the difference between mitigation and restoration for the proposed project. As we understand it, the SR-6 bypass project with enhancements of Scheuber Ditch and wetland complexes will be used as mitigation for the flood project. Restoration projects identified in the draft restoration plan are to be considered separately. We are uncertain what specific restoration projects will be incorporated as part of the Centralia Flood Study and whether the proposed SR-6/Scheuber Ditch project will adequately mitigate for project impacts.

ALTERNATIVES CONSIDERED

The following alternatives have been considered and evaluated during the project planning period.

NO ACTION

No flood damage reduction project would be constructed. It is assumed that flood damage would continue as documented. The WSDOT has stated that as part of their I-5 widening project, they would need to raise the grade of I-5 to 2.5 feet above the 100 year flood level, a stretch of freeway 2.9 miles long in the Centralia-Chehalis area.

SKOOKUMCHUCK DAM MODIFICATION

Modifications to the Skookumchuck Dam would provide flood storage in conjunction with other flood control measures to solve flooding problems along the Skookumchuck River, particularly in the town of Bucoda and the city of Centralia. This alternative would alleviate some of the back watering effect upstream of the confluence with the Chehalis River.

Various approaches to dam modification for flood control purposes have been developed for this project including, 1) the 1986 authorized project feasibility design, 2) two alternatives involving the installation of an inflatable rubber weir on top of the existing spillway crest; and 3) alterations to the outlet structure of the dam. Measures that increased the height of the dam would allow a pool elevation of 492 feet. Alterations to the outlet works would allow the rapid evacuation of stored water down to an elevation of 455 feet. Flood storage between elevations 455 and 492 feet would amount to about 20,000 acre feet.

FLOODPLAIN MODIFICATIONS

Several variations of floodplain modifications, including the "Lewis County Alternative," were developed to reduce flooding in the cities of Chehalis and Centralia, and to prevent overtopping of I-5 and SR-6. All of these were intended to work with some form of dam modification. Variations in these alternatives came from the need to evaluate different locations for the large excavation flowway bypass. The "Lewis County Alternative" was chosen for further consideration and included the following elements: 1) excavation of a flood bypass (from 1 to 2.5 million cubic yards) between River Mile (RM) 68 and RM 66 near Mellon Street Bridge, 2) modifications to the Skookumchuck Dam to provide flood storage, and 3) excavation to improve conveyance of flood waters under SR 6, and 4) creation of a 1.5 mile long berm to direct and attenuate flood waters. A document produced by PIE (1998) states that the extra flood storage provided by the dam would mitigate the downstream flooding expected to occur from the increased conveyance.

LEVEE

The levee proposal is intended to reduce flood damages, address flooding along Salzer and Dillenbaugh Creeks and the Newaukum River, and keep I-5 open. The basic levee alignment was developed through a previous study in the 1970s to protect flood prone areas in Chehalis and Centralia. The levee system would upgrade existing embankments or levees and construct 10-15 miles of new levees that would allow the river to access the floodplain during frequent flood events but protect infrastructure in more extreme events. This alternative was originally conceived without the modifications to Skookumchuck Dam.

FLOW RESTRICTION DEVICES

The initial concept of the flow restriction devices was to increase floodplain storage in the upper watershed through numerous log jams or other devices, providing benefits to wetlands, groundwater recharge, and fisheries. The basis for this idea was that numerous log jams or areas of channel roughening in the upper watershed could provide habitat benefits, and by encouraging the lateral movement of water, these projects could provide flood attenuation in the project area.

NONSTRUCTURAL MEASURES

This alternative includes watershed management, reforestation, flood-proofing structures, evacuation plans, removal of structures on the floodplain, and land use changes to restrict new construction in the floodplain. Although these measures do not address flood elevations, they are intended to reduce economic damages and increase safety.

INTERAGENCY COMMITTEE ALTERNATIVE

This alternative was intended to reduce flooding hazards and restore river hydrology and floodplain function to support salmonids. Measures include land use changes to restrict construction and filling in the floodplain, adoption of new FEMA maps, an improved flood warning system, upgrades to the city stormwater systems, reduction of transportation closures through a traffic bypass, and measures to reduce flood frequency and duration. The alternative is a sequential approach that requires analysis of benefits of the initial, nonstructural actions before proceeding to more structural solutions.

RELATED ACTIONS AND PRIOR STUDIES

Several other actions being considered under separate processes or authorities have a bearing on the proposed project because of their effect on in-stream flows, fish passage, habitat quality, and/or spawner escapement.

CHEHALIS BASIN STUDY

Initiated by the U.S. Army Corps of Engineers, this general investigation study was authorized under Public Law 106-60 dated September 29, 1999. The intent of this feasibility study is to

address problems associated with flooding and ecosystem degradation throughout the Chehalis Basin. This study will assess potential solutions to problems and recommend a series of actions and projects that have federal interest and local support. The project will have two phases: Phase 1 (the programmatic) will formulate, identify and screen potential restoration projects to carry into phase 2. Phase 2 (project specific) will involve detailed study of selected project alternatives leading to a feasibility report and an EIS. The study is currently in Phase 1.

CHEHALIS FISHERIES RESTORATION PROGRAM (CFRP)

The Chehalis Fisheries Restoration Program (CFRP), administered by the Service, was authorized under Public Law 101-452 in 1990 with a goal of optimizing natural salmon and steelhead production while maintaining the existing genetic adaptation of wild spawners and allowing the highest compatible level of hatchery production. Federal funding, which has consistently been below that authorized by Congress, has averaged about \$200,000 per year for restoration projects, which include fish passage projects, fencing, and riparian planting.

CHEHALIS RIVER BASIN FISHERY RESOURCES: SALMON AND STEELHEAD STREAM HABITAT DEGRADATIONS

The Service mapped areas of habitat degradation in the Chehalis Basin (Wampler, et al.1993). The degradations included areas where a) loss of riparian vegetation had occurred due to agriculture, logging, livestock or unknown causes, b) where livestock had access to streams, c) areas of excessive sediment in stream bed, whether from unknown sources or bank erosion, and d) fish passage barriers. The report identified the source of degradations in some cases (i.e., loss of riparian vegetation and livestock access in the stream), but was less useful in identifying the source in other instances (i.e., excess fine sediments observed in the stream do not indicate where they came from). It also identified beaver dams and log jams as degradations although in most cases these structures are actually valuable to salmonids.

TOTAL MAXIMUM DAILY LOAD (TMDL) PROCESS

Under the Clean Water Act, states are required to identify sources of pollution in waters that fail to meet state water quality standards and to develop a plan to address those pollutants. This process, called the TMDL, found high water temperatures and low dissolved oxygen near the towns of Centralia and Chehalis. Based on these findings, a number of state and local activities are focused on reducing sources of pollution, including improvements in dairy and other livestock operations, and improvements in septic and city storm water systems.

LIMITING FACTORS ANALYSIS (LFA)

This study, implemented by the Washington State Conservation Commission, identifies habitat limiting factors for salmonids in the Chehalis River Basin based on existing information. The report states that one of the biggest problems in assessing habitat conditions and limiting factors for salmonids in this basin is the lack of field data. Many data gaps exist for all parameters. The LFA prioritizes restoration activities needed for salmon recovery. Completed in June 2001, the LFA for the Chehalis River Basin (WRIA 22 and 23) was mandated and funded through the State Salmon Recovery Act RCW 77-85. The report is useful in that it identifies data gaps and

summarizes what is known, and based on that existing knowledge, identifies habitat limiting factors by sub-basin (Smith and Wenger 2001).

WATERSHED PLANNING

Under the State Watershed Planning Act RCW 90.82, a planning group for the Chehalis Basin was formed of local and state government, citizens, tribes, and non-governmental organizations. The group, the Chehalis River Basin Partnership is implementing watershed planning, with an emphasis on water quality, water quantity and fish habitat.

Three watershed analyses provide detailed information about areas of the upper watershed (the Upper Chehalis, the upper Skookumchuck and the Stillman Creek). The Skookumchuck analysis was based on the area above the dam, which is inaccessible to most anadromous fish. Although these analyses can help in understanding some aspects of downstream conditions in the project area, their usefulness in assessing conditions in the project area is limited.

SALMON RECOVERY FUNDING BOARD PROJECTS

As one of many steps taken by the state of Washington toward salmon recovery, this entity oversees state funds for salmon protection and restoration projects and related programs that benefit fish and habitat. Restoration projects funded by the SRFB are selected through partnerships with state, federal, and local agencies, local communities, and tribes. The Chehalis Basin is the recipient of funds for restoration projects through this entity.

FISH AND WILDLIFE RESOURCE CONCERNS

SALMONIDS AND SALMONID HABITAT

We have focused on the potential impacts of this flood project to salmonids because a) salmonids are considered a keystone species with high value to fish and wildlife and the functioning of the riverine ecosystem, b) they have high cultural and commercial value, c) a flood project has high potential to alter aquatic habitat critical to salmonids, d) many of the ecological processes and factors that are important to salmonids (hydrology, riparian areas, wetlands, and functioning floodplains), are also important to wildlife, and e) salmonid populations have declined in Western Washington, resulting in the proposal or listing of various populations under the Endangered Species Act. Bull trout are listed as threatened in this basin. Coastal cutthroat trout are a species of concern, and coho salmon are candidates for listing in this basin.

Although salmonid species differ in their specific habitat requirements for each life stage, they all (including resident fish such as rainbow trout and resident cutthroat trout) share some common needs, including sufficient invertebrate organisms for forage, clean well-oxygenated water, clean gravel for spawning and incubation, and access to and from spawning and rearing areas.

In-stream habitat conditions in selected reaches of the project area are reported in the fish and wildlife habitat study prepared by Pacific International Engineering (PIE 2001). This study includes the proportion of glides, pools and riffles, the location of side channels, condition of stream banks, presence of large woody debris (LWD) and likelihood of recruitment and retention, spawning habitat, off-channel rearing habitat and holding habitats. In addition, this study evaluates the shading potential of riparian vegetation.

Although conditions vary widely, in general, rearing and holding habitat are inadequate in the project area including the Chehalis River mainstem, the upper Chehalis River, and the Newaukum Rivers. Side channels and off-channel habitat are rare, and where they exist, they are often inaccessible during low flow periods. Pools of sufficient depth to provide adequate holding habitat for migrating fish are few in number or else have insufficient cover to provide refuge (2001). Riparian condition varies with adjacent land use, but is considered inadequate throughout the project area.

The Skookumchuck River has somewhat better in-stream habitat, with a low to moderate amount of rearing habitat. Thirty-six percent of the reaches surveyed (33 reaches of 54 possible) contain side channels or off-channel habitat, half of which are inaccessible to fish during part of the year. A third of the surveyed reaches have holding pools with the frequency of pools greater in the middle and lower reaches. The side channels offer rearing habitat for juvenile salmonids, refuge from predators and high velocities, and foraging habitat (PIE 2001).

The degree to which these habitat conditions exist depends largely upon the adequate functioning of physical processes including a natural range of variation of flows, and the routing and delivery of wood, sediments, temperature, and nutrients. Our emphasis in this report has been on understanding the current functioning of these physical processes and how they might be altered by the proposed project. This process-based approach has guided our input on alternative selection and conceptualization of appropriate mitigation and restoration projects. For purposes of this report, we focused on the following process-based factors limiting to salmonids in the upper Chehalis River Basin: 1) hydrology, 2) floodplain connectivity, 3) sediment supply and transport, and 4) riparian condition and large woody debris supply and transport. We have also included some discussion on water quality and fish passage barriers because they are considered limiting factors for salmonids in this basin and because the proposed project could indirectly alter these conditions. We discuss three terrestrial habitats (riparian areas, wetlands, and floodplains), because they could be altered by the proposed project and because they are valuable for both fish and wildlife.

HISTORIC CONDITIONS

Habitat in the upper main stem Chehalis River was much more complex historically than currently, with wetlands and sloughs, beaver ponds, logjams, scour pools, bars, in-channel islands and riparian forests across a broad floodplain (Cherry 2001). This system was hydrologically connected and dynamic with large amounts of organic material and shifting channels that would have supported a high diversity and abundance of aquatic invertebrates, anadromous and resident fish, and wildlife. Cultural resource sites indicate that this was a highly productive area important for food and materials for Native Americans (Corps 2002).

Fish and wildlife evolved in this very complex habitat. Accounts by early settlers indicate that flooding was a frequent event:

In summer, [Lincoln Creek] is an ordinary creek, but [in winter], log jams in the Chehalis River backed the water up the creek, making the valley a sea from hill to hill.. The river was full of brush and drift and there were plenty of [fish]. Frequently in winter, this whole area [Salzer Valley] was like one large lake about four miles across. Many older residents [said that] canoes often plied over this flooded section (Smith 1942).

Log jams and large woody debris played a key role in shaping complex channel structure, channel meanders, and cover. In 1890, the Secretary of War assessed navigation conditions in the Chehalis River from Elma to Claquato, “the river is practically blockaded during the summer and fall by snags, shoals, and a general lack of water; at this time the river is a succession of shoals and pools.” (As cited by the Corps 2002). These records indicate the presence of two log rafts totaling two miles in length near the present day Chehalis Indian Reservation near Oakville (Corps 2002).

Large woody debris acts to trap coarse sediments, and create backwaters to help route waters onto the floodplain (Sedell and Luchessa 1981). According to a geomorphic evaluation provided by the Corps, large woody debris and log jams acted as “switches” to trigger lateral migration of the river, create avulsions, form side channels, and guide flows into floodplain sloughs (Cherry 2001). The sinuosity of that system is still evident from aerial photos which show meander scars, abandoned oxbows and side channels that have been cut off from the river (SAIC 2001).

Pristine conditions were altered through numerous events, including: 1) removal of huge amounts of wood by the Department of War to improve navigation, and until the 1970s by government fisheries offices under the belief that large woody debris was undesirable because it blocked fish passage; 2) construction and operation of splash dams and log ponds used to store and float logs downstream to mills; 3) timber harvest, which reduced the amount of LWD that could enter the stream system and also altered hydrology and sediment inputs; 4) building and operation of the Skookumchuck Dam, which altered flood hydrology and blocked fish passage; 5) bank armoring and dike construction which constrained channel migration, prevented interaction with the floodplain, and reduced the riparian trees available for recruitment as LWD; 6) installation of drain tiles and ditching to drain agricultural lands; and 7) development and the increase of impervious surfaces that altered basin hydrology (Cherry 2001).

The extensive degradation of riparian areas has impaired recruitment of adequate-sized quantities of LWD in Puget lowland rivers. Logs that do enter the river system are smaller than they once were and rarely function well as key pieces to anchor the formation of log jams (Collins et al. 2002). Although many of the practices listed above have been discontinued, degradation persists in most areas and physical processes that would create or maintain aquatic habitat are still disrupted.

Sand and silt dominate the main stem bed material in the project area. Only four in-channel sediment bars exist between the Newaukum and Skookumchuck confluences, and these are largely composed of sand and silt, with small amounts of gravel. The substrate is coarser in the

Newaukum and Skookumchuck Rivers than in the Chehalis main stem. The geomorphic summary states that sediment from the upper watershed appears to settle out prior to reaching the project area so that sediments accumulated in the project area may be controlled by the rate of local supply, i.e., local bank erosion and riverbed scour (Cherry 2001a). Another theory is that local bank erosion produces sediment in such volumes and of such fine caliber that it overwhelms the signature of sediment from upstream sources as the two mix (Bakke 2002, 2002a).

Many riverbanks in the project area have exposed soils and are actively eroding at the toe. This toe erosion undermines the silty, sandy banks and they collapse into the river, resulting in raw bank surfaces that discourage establishment of vegetation (Cherry 2001a).

The effects of channel clearing, loss of riparian vegetation, alteration of hydrology and alteration of sediment and LWD transport is evident in a comparison of aerial photos from 1938 and 1999. These show that the channel has become more simplified with time with fewer islands, side channels, and sloughs. The channel appears to have become more disconnected from the side channels and the floodplain, and little channel migration has taken place. Areal extent of riparian cover appears to have changed little except that the riparian vegetation that exists currently is more likely to be deciduous than coniferous (SAIC 2001). The Newaukum and Skookumchuck River channels have been more dynamic in the last 60 years (Cherry 2001a). The North Fork Newaukum has serious channel incision and terrace erosion, in some areas with cut banks more than 12 feet high (Bakke 2002).

HABITAT-FORMING PROCESSES

Physical processes that create and maintain aquatic habitat (hydrology, channel dynamics, routing of large wood and sediment, etc.) in the project area have been altered by human activities. The following processes are considered limiting factors to salmonid production in the Chehalis River system.

Hydrology

The hydrological regime is extremely important because it drives all other riverine processes that create and maintain habitat important to fish and wildlife. These processes include floodplain connectivity, routing of sediments, and routing of wood and nutrients. Because of their biological importance and the potential that the proposed project could further alter those flows, we have focused on the following categories of flows for discussion: 1) floods, 2) over-bank flows, 3) channel maintenance (or bank full) flows, and 4) low flows.

Floods

In 1997, the Corps re-computed flood frequency curves for the Chehalis River. These show that a flood once considered an extremely rare event with the probability of occurring every 600 years (i.e., a 600 year event) is now on a recurrence frequency of 100 years. What were considered 35 year events in 1980 are now 15 year events (PIE 1998). This information indicates that large scale floods now occur with greater frequency in the upper Chehalis River than they

did in the past. We are using the term, “flood,” here to mean a large infrequent event of greater than 25 year recurrence. We will use the term later in this report in a less specific sense to mean higher flows that overtop their banks and enter the floodplain.

For fish and wildlife habitat, these infrequent events are both an opportunity for the creation of new habitat and an environmental risk (Benda et al. 1998). Large floods modify floodplains through channel migration, deposition of sediment, accumulation of logs and woody debris, or carving new terraces and many other floodplain features. Often these events can create salmonid habitat by avulsions and creation of new side channels or islands, or weakening large trees so that they are eventually recruited as large woody debris. The dynamic working and re-working of the channel and floodplain creates habitat complexity and increases aquatic productivity (Schroeder and Savonen 1997).

Floods are also an environmental risk. They scour spawning gravels, bury redds with fine sediments, or flush away incubating larval salmon and macro invertebrates, the main food source of salmonids (Ziemer and Lisle 1998). Larval salmon and aquatic insects that inhabit the interstices of gravel may be crushed or exposed to high water velocities that sweep them away. Floods also deposit fines into the interstices of the gravel, smothering organisms that dwell there. The risks from floods to salmonids and their prey are lessened in hydraulically complex stream reaches (i.e., with large wood, complex channel structure, or pools) that offer low velocity refuge. In addition, hydraulically roughened areas act to trap spawning gravels and reduce the rate of downstream transport (Pearsons et al. 1992, Schroeder and Savonen 1997).

As floods increase in frequency and magnitude, wood and coarse sediments are more easily transported downstream, particularly in channelized areas. This is the case in many parts of the Chehalis River, which has been referred to as a “depauperate” system, meaning it has little LWD. High water events typically increase erosion or trigger development of side channels, but where banks are armored, as they frequently are in the Chehalis (with concrete, auto bodies, and rip rap), or the channel is hydraulically smooth without large wood, the water may begin to scour away the bed, resulting in channel incision. Channel incision, which exists in many parts of the Chehalis system, increases the disconnection of the river from the floodplain and offers little opportunity for new habitat to form or to be retained in the system.

We are concerned about the potential for dam modifications to eliminate flood events that create and maintain off-channel habitats, recruit spawning gravel, and flush fines out of gravel. The levee system may constrict the area available for lateral flooding during large scale events. This could pass a higher flood stage downstream, which could result in disturbance of habitats lower in the watershed and a proliferation of flood or bank stabilization projects that would further degrade the system.

Hydraulic modeling indicates that the levee system would result in an increase in flood stage at a 100 year event in some areas (between RM 70.74 and RM 78, with a maximum of 0.61 feet at RM 72.8) and a slight decrease (less than one foot) in other areas. Based on the hydraulic modeling and geomorphic evaluation provided by the Corps, we believe that these impacts from the setback levees would be relatively minor. The Corps plans to conduct sediment studies in the

Skookumchuck River that will provide better detail about the types of impacts expected to arise from dam re-operation and how to mitigate those impacts.

Over-bank flows

Over-bank flows in many systems occur on a 1 to 10 years recurrence interval (Hill and Platts 1991). Despite the altered hydrologic cycle in the Chehalis basin, over-bank flows occur in the project area approximately every 2-5 years, except where levees are located (Tetra Tech 2001).

Over-bank flows are important for recharging groundwater aquifers which supply water to the stream during the dry season. When a stream floods, the water is stored in streambanks, in floodplains, and in wetlands. When a flow rises to the top of the bank, water moves into the streambanks, called "bank storage." This bank storage returns to the stream within a few days or weeks and can help attenuate flood peaks. When a stream overtops its banks and spreads out into the floodplain, widespread recharge to the water table occurs. In this instance, the water takes a much longer time, i.e., weeks, months, or in some cases, years, to return to the stream (Winter et al. 1998). Ground water and surface water are interconnected to such a degree that they should be considered a single resource.

Areas with poor permeability contribute less and areas underlain by highly permeable sand and gravel (as exists in the northern part of the project area), contribute more to base flow. Studies have shown that ground water contributions to river flows, termed "base flow" range from 14% to 90% (Winter et al. 1998). Much of that groundwater is from upland sources derived from infiltrated precipitation as well as river flooding. The Corps has stated that base flows are derived mainly from infiltration of precipitation, and that the contribution from overbank flows and flooding is relatively small.

Over-bank flooding is critical for productivity and community composition of the floodplain and riparian areas (Mundie 1991). Riparian plants on floodplains grow along a gradient of moisture and oxygen which is related to the frequency, timing, and duration of flooding (Hughes 1997). When the flood retreats in sequence with the growing season, for example, it affects the type of riparian community that develops, and this governs the quality of habitat provided to wildlife species (Sparks et al. 1990). Most riparian species can withstand varying degrees of inundation, however the season in which inundation occurs can be critical (Naiman et al. 1998). When the over-bank flooding is reduced in frequency, the riparian community comes to resemble upland plant communities, which may support fewer wildlife species (Nilsson 2000). Migratory birds depend upon finding food at a particular time on flooded floodplains and their chances for survival may decrease if the timing is off (Sparks et al. 1990).

Modification to the operation of Skookumchuck Dam for flood control is expected to reduce the frequency and extent of overbank flooding to a 2 year event or less. Data provided by the Corps indicates that most (72%) banks of the river currently do not experience overbank flooding at the 2 year event. Under the re-operation of the dam, this would occur even less frequently (Corps 2002a). We are concerned that the reduction in overbank flooding will reduce wetland recharge and alter the function and value of wetlands, floodplains, and riparian zones. Existing off-

channel habitats, many of which are already inaccessible at low flows, would tend to get overgrown with vegetation and fill in with a reduction in overbank flows.

Depending upon the flows at which this river flushes fines from the gravel, we could also see a build up of fines in spawning gravels, resulting in less usable spawning areas for salmonids. We are also concerned that reducing overbank flooding would restrict one of the processes (floodplain flooding) by which trees are weakened, root systems scoured, and large woody debris is recruited into the river.

Channel maintenance flows (bank-full flows)

Depending upon the stream, the annual maximum flood exceeds bank-full flooding about once every 1.5 to 2 years (Montgomery and Buffington 1998). At bank-full stage and higher, a river reconditions its channel and cleanses fine sediment out of spawning gravels. These flows determine the ratio of pools to riffle, and the pattern of sinuosity (Mundie 1991). The bank-full discharge is important for transporting sediment, preventing vegetation growth in the channel, and maintaining channel form (Hill and Platts 1991).

Depending on the size of the sediment particles, bed load transport occurs over a wide range of flows. Where gravel is present, flows that move the bed load are important because they allow fine sediments that would suffocate larval salmon to flush downstream (Hill and Platts 1991). Channel maintenance flows generally occur from a 2 year to 5 year event (P. Bakke, pers. comm 5-16-02).

Timing of bank full flows is also important. Peak flows govern the timing and extent of fish spawning runs. When floods occur during spawning runs, the distribution of spawning salmon increases (Hill and Platts 1991).

Operating the dam for flood control is expected to result in more frequent and longer duration bank-full flows than occur presently. This type of flow alteration could result in increased scour and transport of spawning gravels and large woody debris so that these materials become less and less common in the river over time. In addition, increased bank erosion could result in increased bank armoring. In areas where bank armoring already exists, the increased bank-full flows could result in increased bed scour and channel incision. We expect this to have an influence on sediment and large wood transport and routing, on channel maintenance, and the quality of instream habitats such as pools, pool/riffle ratios, and spawning beds. The Corps plans to conduct sediment and geomorphic studies of the Skookumchuck River during the PED phase of planning. These studies should help to determine in better detail the nature of impacts and how to mitigate them.

Low Flows

Low base flows are a problem throughout the main stem Chehalis and many tributaries. Data taken from the Porter stream gauge, indicated that the main stem flows from the Upper Chehalis Basin decreased 19% since 1953 while precipitation decreased only 6% (Wildrick et al. 1995). Many of the tributaries in the upper basin are closed to further water allocation, including Salzer

Creek, Dillenbaugh Creek, and the South Fork Chehalis River. Minimum base flows set by state rule are frequently not met in the Skookumchuck and Newaukum sub-basins (Smith and Wenger 2001).

The low base flows are believed to be related to groundwater and allocation of water resources. During low rainfall months, the Chehalis River and tributaries are maintained mostly by groundwater discharge from aquifers, and in WRIA 23, base flows depend solely on ground water discharge. The rate averages about 3 cfs gain per river mile in the Chehalis mainstem (Wildrick et al. 1995).

This dependence on groundwater is explained by the geology of the upper Chehalis basin. Much of the project area is underlain by the East Chehalis Aquifer, a 52 square mile aquifer located in the valley of the upper Chehalis River. It extends upstream from the confluence of Scatter Creek and underlies the main stem and south fork Chehalis River. This aquifer consists mostly of alluvial deposits of gravel, sand, silt, and clay. North of Centralia, and along the Skookumchuck River, the aquifer consists of sandy gravel outwash. The aquifer is thicker in the north (about 90 feet) and thins to the south. The water from this aquifer flows into the Chehalis River ranging from 0.5 to 4.5 cfs per mile. These inflows are higher in the area near Centralia due to higher hydraulic conductivities and increased aquifer thickness (Larson 1994). Although flows in the Skookumchuck River are augmented by releases from the dam, these releases are a small part of the total flow in the Chehalis River (Wildrick et al. 1995).

The Upper Chehalis Basin is believed to be over appropriated for water withdrawals. Consumptive water use partially explains the reduction of stream flows in the Upper Chehalis Basin. This water is used for irrigation, municipal use and power. Irrigation accounts for the highest withdrawal, drawing from both ground and surface water sources. (Mendoza 1998). Although minimum in-stream flows were set by the state in 1976, it is unclear the degree to which biologists were consulted about those levels and whether they meet the needs for fish (email communication, Jennings 2001).

In addition to water withdrawal, there may be impaired natural groundwater recharge in the upper Chehalis River Basin, although the amount would be difficult to quantify. In many areas of the Chehalis River, levees, roads or incised channels prevent flood waters from reaching the floodplain where they could recharge groundwater. In other areas, over-bank flows occur in developed areas over impervious surfaces or agricultural drain tiles, where there is no opportunity for recharge. Loss of wetlands, artificial diversion of flood waters through ditching and ground water withdrawals all contribute to a loss of base flows and poor water quality. Low flows have little effect on channel morphology but they are important biologically (Montgomery and Buffington 1998), particularly for salmonids. Low flows limit the access of juvenile fish to summer rearing areas and dry out available habitat. They can limit available habitat to spawning salmon (Wildrick et al. 1995).

In the Chehalis system, the production of coho smolts is influenced by several variables, including winter flows (which cause gravel scour and influence egg survival), summer flows (that ensure rearing habitat), and fall flows (which limit spawner distribution). The most important variable appears to be spawning flows during November and December, which explain

much of the variation in the smolt production. The hypothesis is that fall flows provide access to upper portions of the watershed for spawning adults. After fry emerge from gravel, they distribute generally downstream despite flows that might enable them to rear higher up in the watershed (Seiler 2002).

Reduced flows exacerbate water quality problems, because sufficient water is needed to dilute the effects of pollutants (Benda et al. 1998). This is of particular concern in the Chehalis River which is on the Washington State 303(d) list for not meeting state water quality standards for temperature, dissolved oxygen, fecal coliform and PCBs. Fish and wildlife habitat is degraded in various areas due to seasonal low flows, high temperatures and low dissolved oxygen. Water quality problems that are not injurious to fish under adequate flows may become lethal or a blockage to migration under low flow conditions (Ziemer and Lisle 1998).

Based on an evaluation by Corps hydrologists, the baseflow in the Chehalis River is derived mostly from infiltration of precipitation throughout the watershed. Although baseflows may be augmented immediately after a flood, the effect is unlikely to last into the dry season when low flows are a problem for fish. Based on this information, the proposed project may have less impact on groundwater and base flows than originally thought.

Floodplain connectivity

Lack of off-channel habitat or functioning wetlands are considered limiting factors throughout the Chehalis basin (Smith and Wenger 2001). These conditions are related to the altered hydrologic regime, disconnection of the floodplain from the river, and loss of channel migration (Tetra Tech 2001). The Limiting Factors Analysis prepared by the state (LFA) rates floodplain conditions in the project area on the Chehalis River main stem as “poor” because of channel incision, with a low width to depth ratio, and steep high banks (Smith and Wenger 2001).

Side channel habitat is documented in a third of the reaches surveyed in the Skookumchuck River, most of those in the upper and lower reaches (PIE 2001). The Skookumchuck River below the dam is primarily in agricultural or rural residential land use. Much of the lower river has encroaching development, and the banks are commonly armored. Channel incision is common here although the upper reaches are less confined. The armoring and channel incision prevents lateral spreading of water during higher flows so that the flood energy cannot dissipate. This may result in bed and spawning redd scour, filling in pools, and excessive transport of LWD. Development and bank armoring in the Skookumchuck and Hanaford sub-basins have limited the opportunity for future side channels to develop. Other sub-basins in the project area also have channel incision and little off-channel habitat, including the Newaukum, Salzer, and China Creek.

The main stem Chehalis River is disconnected from the floodplain in many areas due to bank armoring, roads, levees, channel incision and channel re-alignments. These disconnections prevent lateral migration of the channel, recharge of wetlands, and formation of off-channel rearing habitat. The capacity of groundwater recharge is reduced because the water is not spreading into the floodplain, but rather is concentrated in the channel (Tetra Tech 2001). The river in the Centralia Reach is very deep and slow, with deep water extending close in to shore.

Many areas have clay banks at the water's edge overtopped by cut banks of loose fine material that is easily eroded. Many areas are armored with concrete or auto bodies.

The Limiting Factors Analysis states that channel incision occurs on the main stem between River Mile 57-79. Factors contributing to channel incision include debris torrents that have incised the channel in the upper watershed, loss of grade control, loss of upstream sediment sources, increased peak flows, reduction in hydraulic roughness, and channelization from levees or bank armoring or fill encroachment (Smith and Wenger 2001, Bakke 2002). A geomorphic evaluation provided by the Corps states that channel incision in the project area probably started with wood removal and was exacerbated by bank armoring. During peak flows, stream energy is unable to dissipate against the roughness of the wood and banks and instead concentrates on working the bed. Over time, the bed has eroded down so that the river is much lower than its floodplain and floods laterally less frequently than before (Cherry 2001). Channel incision inhibits the formation of side channels and results in a loss of habitat, as well as loss of opportunity for more habitat to form.

Functioning floodplains are biologically valuable for fish and for the processes that create and maintain habitat conditions. The lateral spreading of water and hydraulic detention helps attenuate the velocity and magnitude of floods downstream, and thereby the damaging disturbance potential of floods. In addition, the flooding of floodplains recharges groundwater aquifers and wetlands that help in maintaining base flows in the river and providing diverse terrestrial habitats. The off-channel habitats and side channels formed where the river is free to migrate laterally, are among the most productive habitats for salmonids (Sedell and Luchessa 1981). Floodplains also act as repositories for fine sediments deposited during floods, reducing the amount of silt passed downstream to degrade spawning gravels (Sedell and Luchessa 1981).

The reason floodplains are so highly productive is because of the disturbance regime provided by flooding and the deposition of sediments and nutrients. Invertebrate production, important as prey resources for fish, is one to two orders of magnitude greater in floodplain channels than in the adjacent main stem channel streams. A study done in California showed juvenile chinook salmon rearing in an agricultural floodplain channel had a higher growth and survival rate than those rearing in the adjacent river channel, a area with little shallow water and armored banks (Sommer et al. 2001).

High productivity occurs whether a floodplain is located higher or lower in a watershed. This is because most of the nutrients that provide high productivity are produced locally in the "moving littoral" of the advancing and receding flood rather than being carried to the area from upstream sources. This idea has important implications in degraded watersheds, because it means that floodplains-if they are connected- remain relatively in tact and productive despite conditions in upstream drainages (Sparks et al. 1990). This suggests that restoration of floodplain areas and alluvial reaches of rivers makes sense even when degraded conditions upstream in the watershed have not been addressed.

Dam re-operation would result in increased duration and frequency of bank full flows which can increase channel incision, especially in areas that are already armored. Elimination of all floods

over a 2 year event is likely to result in the loss of opportunity for side channels to form or existing ones to be maintained.

The levee system will contribute to loss of floodplain storage if fill is imported for constructing the levees. If development continues to occur riverward of the levee system, it would lead to further filling of the floodplain, increased disconnection of the river from its floodplain, increased wetland filling, and degradation of natural floodplain functions.

Sediment quality and quantity

The Chehalis basin is ranked “poor” in the limiting factors analysis for sediment conditions (Smith and Wenger 2001). Large sediment loads enter the Chehalis River upstream from its tributaries and locally from bank erosion. Tributaries in the project area that contribute the most sediment are the Newaukum, South Fork Chehalis, and upper Chehalis sub-basins.

An estimated 25% of the sediment load for the entire Chehalis Basin comes from the upper Chehalis basin, with most of that from the South Fork Chehalis, the Upper Chehalis, and Newaukum Rivers. Poor sediment conditions are due to increased peak flows coupled with a lack of channel roughness and LWD to hold sediments in place and erosion which transports fine sediments into the water. Excessive sedimentation is associated with a high density of roads, livestock access to the river, erosion, removal of riparian vegetation, clear cuts in the upper tributaries, and agriculture and urban land uses (Smith and Wenger 2001). Agricultural and urban areas contribute to bank erosion, which is common in the Skookumchuck, Newaukum, South Fork Chehalis and upper Chehalis sub-basins. In most tributaries, large sediment is too easily transported downstream (Cherry 2001).

Spawning gravels

The Skookumchuck River, an area that was glaciated, is dominated by very coarse gravels. Larger cobbles and small boulders are frequent in the upper and lower reaches, where anadromous spawning occurs. Anadromous fish spawning habitat is documented in all but three reaches in the areas surveyed. Resident fish spawning is also common, and believed to be especially prevalent in the middle reaches where the gradient is lower and gravel sizes smaller. Numerous tributaries provide spawning for resident fish species and coho salmon (PIE 2001). The Skookumchuck Dam blocks transport of gravels downstream although according to the Corps, gravel contributions from the tributaries and from bank erosion make up the dam impacts within 1,800 feet of the dam (Corps 2002a). Substrate size increases in reaches just downstream of the dam, to the extent of exposing bedrock in some places. In some places, the substrate below the dam is sand with flat rocks. At the stream gauge a half mile downstream of the dam, the substrate consists of gravel and larger cobbles. Bed movement is evident and there is little embeddedness (Bakke 2002). The quantity of gravel lower in the Skookumchuck River appears to be good.

The quantity and quality of sediment in a stream system can determine the quality of salmonid habitat. The amount and type of sediment in a basin varies with the watershed, topography, climate, soil type, soil saturation, up slope disturbance, vegetation, and hydrology. Sediment

quantity is also related to the efficiency of transport, retention, and supply mechanisms. Average annual transport depends upon the frequency and magnitude of flows, with higher transport tending to be associated with more frequent floods. Retention refers to the degree of channel roughness, especially large wood, which tends to hold sediments in place. Sediment supply depends upon coarse sediment input from upstream, which can be blocked by dams or culverts, or reduced through channelization that prevents lateral channel movement which might recruit those sediments. A high degree of channel roughness tends to balance increased discharge so that sediment transport becomes less excessive (Montgomery and Buffington 1998).

Fine sediments and turbidity

The Limiting Factors Analysis prepared for the Chehalis Basin (LFA) defines poor quality of spawning gravel as gravel with greater than 17% of fines. (Fines are defined as particles of less than 0.85 mm). Although several areas in the North and South Fork Newaukum River were rated “good” for sediment quality, most of the project area scored a “poor” for this parameter, or else there was a lack of data to assess it. Excess sediment delivery is considered a major problem throughout most of the sub-basins in WRIAs 23 and 22 (Smith and Wenger 2001).

The Skookumchuck Dam traps sediments and may provide some benefit in reducing turbidity for some distance downstream. However, the tributaries provide inflow and turbidity to the river. Big and Little Hanaford Creeks, major tributaries of the Skookumchuck River, deliver high levels of turbidity (Corps 2002a).

Salmonids are particularly sensitive to excess turbidity, which has both lethal and sublethal effects and is associated with loss or reduction of fish populations. Sub lethal effects include: 1) clogging gills, causing respiratory distress; 2) reduced ability to see and find prey species, which can result in a lower growth rate; 3) reduced tolerance to pathogens and contaminants; 4) physiological stress interfering with the ability to perform vital functions; and 5) avoidance of areas with turbidity so that migration and distribution is altered (Waters 1995, Newcombe and MacDonald 1991). Effects on reproductive success include: 1) burying spawning redds; 2) filling of the interstitial spaces in gravel so that eggs and larval salmon fail to get adequate water flow and oxygen; 3) smothering embryos and sac fry; and 4) entrapment of emerging fry (Waters 1995).

Suspended sediments in a stream also reduce the abundance of aquatic macro invertebrates, food resources for salmonids (Newcombe and MacDonald 1991). Impacts to aquatic invertebrates usually occur either directly by clogging feeding structures or limiting light penetration, or indirectly, through increasing the embeddedness of the stream bed. When fines settle into the interstices of cobbles and large particles, the spaces between large particles is eliminated, called “embeddedness.” As fines increase, filter feeders decrease and burrowing invertebrates, which are not preferred food for fish, increase (Waters 1995, Newcombe and MacDonald 1991). Once the decrease in macro invertebrates occurs, it can persist until an area is colonized by flying adults, drifting insects from undisturbed upstream reaches, or the deposited sediments are flushed out (Waters 1995).

We are uncertain what effect the alteration of flows from the Skookumchuck Dam re-operation will have on sediment transport and routing. Altered flows may cause a shift in size classes of substrate and associated changes in habitat and the species of fish that depend upon it. With reduced overbank flooding, off-channel habitats may fill with sediments, become overgrown with vegetation, and become unusable as rearing habitat. If channel maintenance flows do not occur regularly, gravel may fill in with fine sediments, rendering it less usable to fish for spawning. With fewer overbank flows, fines will be passed down the river, instead of deposited on the floodplain. Increased bank-full flows may cause excessive transport of coarse sediments initiating a cycle of incision, increased bank erosion, and result in excess turbidity.

Large woody debris recruitment and routing

Rearing and holding habitat for salmonids is commonly created by the presence of large woody debris (LWD). Large woody debris is extremely important for salmonids and in stream ecology, including: a) it influences channel form and roughness; b) it causes deposition and retention of coarse sediments and particulate organic matter, which otherwise would rapidly flush downstream; c) it provides a substrate and food source for macro invertebrates; and d) it provides preferred habitat and cover for salmonids (Bilby and Bisson 1998).

The main stem Chehalis, Newaukum, Salzer and South Fork Chehalis sub-basins have extensive areas of riparian degradation or else lack a riparian zone altogether. Not surprisingly, the project area is generally considered “poor” in terms of large woody debris (LWD). Where levels of in-stream LWD are known, it is considered to be present in low quantities (Smith and Wenger 2001).

A fish and wildlife habitat study prepared by Pacific International Engineering mapped the near term recruitment potential for LWD, based on methods in the Watershed Analysis Manual developed by the Washington State Forest Practices Board. This method determines the near-term recruitment potential of a stream reach based on whether the channel has LWD in it, whether it would retain LWD, whether LWD would function for habitat purposes, and LWD loading potential (i.e., condition and composition of the riparian zone) (PIE 2001).

The report concluded that the project area is very degraded for this parameter. Most of the lower elevation areas, which have either an agricultural or residential land use, consist of a sparse hardwood canopy and if present, a shrub understory. This study showed that all reaches in the project area are at either high or moderate risk of negative impacts due to low levels of LWD, low potential for LWD recruitment, or low retention of LWD due to channel conditions. Many parts of the project area, especially the main stem Chehalis and Skookumchuck Rivers have no riparian zone with, therefore, no recruitment potential. The areas that have some potential for recruiting LWD (i.e., have riparian corridors with trees) have little retention potential (i.e., have high velocity flows or are not hydraulically rough). Many other areas have riparian vegetation, but it is sparse and small (PIE 2001).

The Centralia Reach has many areas with cut banks up to 10 feet high, with little opportunity for vegetation to become established. Some areas are well vegetated along the banks, although trees tend to be medium-sized. Where cattle are allowed access to the banks, vegetation cannot

become established, and the banks often collapse. Some large wood is evident in this main stem reach and in increasing amounts upstream of the SR-6 overpass. However, the opportunity for recruitment is small.

There is little opportunity for LWD recruitment to occur upstream of the project area. Three watershed analyses done in the upper Chehalis Basin (the Upper Chehalis, the upper Skookumchuck and the Stillman Creek) reported limited LWD in all areas surveyed and a low potential for in-channel habitat as a result. In addition, any LWD recruited from above the Skookumchuck Dam would not be transported past this blockage to downstream area. Lack of LWD in the channel and available for near-term recruitment was defined in these analyses as a key factor warranting improvement (Mendoza 1998).

Large woody debris benefits salmonids at multiple life stages, including recruitment and storage of spawning gravels, dissipating high energy flood flows during incubation, increasing pool density, providing cover for summer rearing, and low velocity refugia and cover for overwintering. Fish populations are larger in streams with large amounts of LWD than streams with low amounts, particularly coho and cutthroat trout (Bilby and Bisson 1998), both species that inhabit the Chehalis system. Where LWD is present, it helps to create, stabilize and provide cover in side channels for salmonids (Sedell and Luchessa 1981).

The dam re-operation would be expected to eliminate flooding over the 2 year event which could affect the structure and composition of the riparian area and could increase the invasion of exotic species. In addition, large floods weaken trees and cause recruitment as LWD. Increasing the duration and frequency of bank full flows may increase the transport of LWD out of the system.

Water Quality

Poor water quality in the upper Chehalis basin is well documented by the Washington State Department of Ecology, especially for temperature and dissolved oxygen (DO). The Skookumchuck River has a history of habitat degradation resulting in low DO, high temperatures, and increased turbidity, but these conditions have improved in recent years. Cold water releases from Skookumchuck Dam, in particular, have helped reduce water temperatures. One of the Skookumchuck's main tributaries, Hanaford Creek, has high levels of fecal coliform and turbidity (Corps 2002a).

Low flows worsen water quality problems, as mentioned previously. State standards for temperature, fecal coliform, pH, DO, and other criteria are often not met during low flow periods. Dissolved oxygen and temperature are particularly important factors for determining suitable habitat for salmonids (Mendoza 1998).

Dissolved oxygen is a measure of the oxygen-absorbing capacity of the water. The amount of DO determines habitat suitability for fish and invertebrates. Low DO reduces the swimming performance of juvenile and adult salmonids and may halt migration (Welch et al. 1998).

Causes of low DO are varied and interrelated with other physical and chemical processes in rivers. Dissolved oxygen decreases with increasing water temperature and increasing levels of

fine sediments and nutrients, such as fecal coliform. Low DO is associated with removal of riparian vegetation, factors which reduce stream flow, organic debris from logging, urban stormwater, sewage, food processing plants, and dairies. These inputs of nutrients increase the biological oxygen demand, which reduces the available DO in the water (Castro and Reckendorf 1995).

The mainstem between Newaukum and Skookumchuck Rivers is deep, slow moving and in the summer, the water near the bottom is very low in DO. This is a natural condition to some degree but is worse during algal blooms which result from high levels of nitrogen produced by the Chehalis waste treatment plant and upstream non-point sources. Algal decay stimulates bacteria growth, which consumes oxygen. This situation is worsened by higher temperatures. In summer, dissolved oxygen levels have been as low as 0-0.5 mg/l (Smith and Wenger 2001). Levels of DO also fluctuate diurnally.

Temperature provides a cue for many life history stages, such as insect emergence, or fish spawning. Warmer than normal water temperatures may cause premature emergence from the gravel, which reduces survival. In the summer, higher temperatures may cause thermal metabolic stress, higher competition for cool water refugia, and lower DO levels (Welch et al. 1998). For most aquatic species, thermal limitation is more important than the availability of specific types of food (Stanford et al 1996). Temperature increases may alter fish species composition, favoring warm water species over salmonids which then leads to increased predation on salmonids.

Physical factors that influence water temperature include riparian vegetation, ground water/hyporheic interactions, tributary inflow, water depth, water discharge, and air temperature (Welch et al. 1998).

The hyporheic zone, the area of interchange between surface and subsurface water, helps to cool water temperatures, crucial for fish production (Smith and Wenger 2001). Water cycles through the aquifers and hyporheic zone, mixing with groundwater from upland and floodplain sources. Surface water alternatively enters and exits the hyporheic zone, which acts to process nutrients and provides a thermal sink, cooling the river during warm low-flow periods. Fish use areas of upwelling and downwelling for spawning. In addition, they function in areas of upwelling or downwelling that create mosaics of different habitat based on soil moisture conditions and hydrology (Stanford et al. 1996).

We do not know the extent of the hyporheic system in the project area. Given the documented problems with temperature and low flows, we would be concerned about any activity that tends to increase channelization or that could interrupt the connection between surface water and ground water (i.e., constricting levees, removal of riparian vegetation, bank armoring). Correspondingly, we believe that restoration activities that increase roughness, natural channel dynamics and riparian vegetation would increase this connectivity.

The setback levees may improve water quality in those areas where contamination is currently allowed to enter the river in storm run off. Where levees are designed to surround these contaminated areas, run off into the river may be decreased, with an improvement in water

quality. Planting the levees with native shrubs and trees may improve water quality by buffering the effects of stormwater runoff into the river and its tributaries.

Fish passage barriers

The main stem Chehalis River has no human-made structures that block fish passage upstream or downstream, although water quality can be barrier to fish passage. During late summer, low flows, temperature and low levels of dissolved oxygen in the Centralia Reach often combine to block Chinook salmon that are attempting to go upstream to spawn (Hiss and Knudsen 1993). Numerous blockages or potential blockages to fish passage have been identified in streams throughout the project area. Most of these are improperly designed culverts. Lewis County plans to assess habitat above these blockages in order to prioritize projects for remediation.

The Skookumchuck Dam is a complete block to anadromous fish and is considered the greatest impediment to salmonid distribution in that sub-basin. The winter steelhead population is considered depressed, and it is unclear the degree to the dam has contributed to this decline (WDFW 1992). Wild winter steelhead are trapped and trucked around the dam to be released either in the reservoir or above the natural cascades in the main stem Skookumchuck River above the reservoir. It is assumed that wild steelhead spawners trapped below the dam each year are progeny from those fish hauled above the dam, but this assumption is by no means certain. The spawner returns could also be the progeny of hatchery steelhead that have spawned naturally in the Skookumchuck River. We are also uncertain how the current dam configuration provides downstream passage for adults or juvenile steelhead or resident cutthroat trout. It is possible that few smolts make it to the sluiceway or, if they do, survive passage through the dam. There are apparently no available studies to prove or disprove this. We are uncertain whether adults that would normally return to the ocean after spawning (kelts) survive passage downstream. We also do not know whether adult salmon of other species die in the plunge pool below the dam in unsuccessful attempts to migrate upstream.

When the dam was built in 1970, it eliminated 3.6 miles of spring and fall chinook habitat and 8 miles of coho habitat (Smith and Wenger 2001). Before construction of the dam, the Skookumchuck River above the dam provided holding, spawning and rearing areas for spring and fall chinook, coho and steelhead. Coho utilized the river up to an impassable falls near RM 28.9 (USFWS 1989). Resident cutthroat trout do spawn and rear above the dam. Juveniles may be swept over or through the dam occasionally.

Fish passage is not considered a problem in the main stem Chehalis River and major tributaries. Re-operation of the Skookumchuck Dam for flood control will include construction of larger outlets for better control of water release. We are uncertain what the existing condition is with respect to smolt survival past the dam. If these outlets are constructed to ensure fish passage for smolts as well as out-migrating steelhead adults (kelts), the project could improve conditions for winter steelhead.

TERRESTRIAL HABITATS

We have included the following three terrestrial habitats in our discussion because of their value to wildlife and their contribution to functioning riverine processes.

Riparian areas

As discussed earlier, the main stem Chehalis, Skookumchuck, Newaukum and South Fork Chehalis Rivers have poor riparian conditions overall, although some reaches in the upper watershed are considered “fair” or even “good” for riparian conditions (Smith and Wenger 2001). Much of the information that the LFA used for scoring riparian conditions was based on watershed studies done in the upper tributaries of the watershed and are not really applicable to most of the project area. A restoration plan provided by the Corps states that poor riparian conditions may be the most widespread problem throughout the basin (Tetra Tech 2001).

A study by Pacific International Engineering characterized riparian condition in the project area as inadequate. The report states that riparian areas, where they exist at all, are often narrow in width, sparsely vegetated, and/or have small or medium sized trees. Hardwoods or mixed hardwood/conifers are common; some areas have a low shrub layer. In the Chehalis main stem, more than two-thirds of the riparian areas lack vegetation or have only sparse riparian coverage. Only four reaches within the entire study area (in the upper Skookumchuck and Newaukum sub-basins) had adequate shading levels. All other reaches surveyed are considered at risk for stream shading (PIE 2001).

Riparian areas have been fragmented, degraded and eliminated by agriculture and residential development, timber harvest, fires, and dam break floods. The degradation results in poor buffering of runoff and human disturbance, increased water temperatures, sediment transport, scour, poor LWD recruitment, and few pools. The riparian zones have little value to wildlife as movement corridors (Tetra Tech 2001).

Riparian zones are extremely important to both fish and wildlife, providing nutrients, natural corridors for migration organic debris, diversity of structure, high edge to area ratios, microclimate, and habitat features for foraging, breeding, and cover. Riparian areas usually have complex plant communities due to the disturbance regime offered by the variability of river flows, flooding, and channel dynamics. This diversity of plants and physical structure provides habitat for many species of wildlife. Of the 593 wildlife species that occur in Oregon and Washington, for example, 319 (53%) use riparian zones (Johnson and O’Neil 2001).

Wildlife species use riparian areas disproportionately more than any other type of habitat. Although riparian areas occupy less than 1% of the area in the Western United States, they provide more habitat for breeding birds than any other vegetation type (Bolton and Shellberg 2001). Large rivers, like the Chehalis, provide habitat for a greater bird abundance, species richness, and species diversity than small rivers where bird communities tend to resemble upland bird communities. The wide rivers provide habitat for large-bodied birds, including waterfowl, heron, and osprey. (Kelsey and West 1998).

About 29% of wildlife species in the Pacific Coast Ecoregion are riparian obligates, depending upon riparian and aquatic resources for their survival (Naiman et al. 2000). Bird groups in this category include: loons, grebes, cormorants, ducks, geese, hawks and falcons, herons, rails, coots, kingfishers, and some of the passerine birds. Small mammals in this category include many shrews and voles, raccoons, otters, and beaver. Of the 30 amphibian species that occur in the Pacific Coast Ecoregion, 60% are riparian obligates, requiring aquatic habitat for reproduction (Kelsey and West 1998).

The value of riparian habitat for terrestrial species is high compared to upland areas, given the broad impacts of human activities. In the Pacific Coast Ecoregion, riparian areas historically differed little from pristine upland areas in their value to wildlife. This is because riparian areas and late successional forests provided plant composition diversity and structural complexity important to wildlife (Kelsey and West 1998). In developed landscapes, where much of the upland habitat has been converted to other land uses, riparian areas may be among the few places that provide complex habitat such as understory and mid story vegetation.

The Corps has stated that the flood storage capacity of the dam and reservoir at elevation 492 feet, the “high dam” option, would only be used for a 70 year event, coming into full capacity at a 100 year event. Provided that the higher level reservoir is retained for no longer than five days and is used no more than once every other year, we believe that impacts to shoreline vegetation from the “high dam” option would be minimal.

The elimination of most overbank flows in the Skookumchuck River as the result of dam re-operation could result in changes to the structure and plant community of the riparian zone. Construction of the levee system will result in the loss of some riparian vegetation.

Floodplains

Floodplains are the transition zone between the uplands and river, and surface water and groundwater environments (Stanford et al. 1996), and as such they are highly productive, biologically diverse areas. Floodplains are high in biodiversity for the same reasons as riparian areas with diverse plant, benthic insect, and fish and wildlife communities. When large floods occur, the vegetation community gets reset from late successional to early successional, thereby increasing habitat and species diversity. Floodplain productivity is related to the large area of habitat, frequency of flooding, patterns and timing, inputs and retention of nutrients and sediments, physical diversity of habitat (i.e., depressions, riparian plant communities, unvegetated and vegetated borders and backwaters, and seasonally flooded vegetation communities), decomposition, and decreased predation or competition (Sommers et al. 2001, Sparks et al., 1990).

Alterations to flows in the Skookumchuck River due to dam alteration may contribute to channel incision and loss of floodplain function and connectivity. The setback levee system would help to prevent further degradation of the floodplain provided that future development on the riverward side of the levees is restricted. Restoration in the form of riparian plantings, wetland restoration, reconnection of oxbows, and increasing floodplain storage could improve floodplain

function and value for fish and wildlife. We do not know the areal extent of floodplains in the project area or how much of what exists is covered by impervious surfaces.

Wetlands

The wetlands in the project area include forested, scrub shrub and emergent wetland types, all dependent upon the hydrologic cycle, including high seasonal water tables, periodic flooding and seasonal ponding. Agriculture, logging, urban development and transportation corridors have interrupted the hydrologic cycle of these wetlands and disrupted the ecological connectivity. These wetlands are important for flood attenuation, water storage that contributes to base flows in streams and for fish and wildlife. For wildlife, these wetlands provide habitat for feeding and migration. These wetlands are important to birds for nesting, foraging and resting. Their value for aquatic species includes providing organic debris, aquatic and terrestrial insects, and shade (Corps 2002).

Wetlands and hydric soils are extensive throughout the project area, particularly in the floodplain of the Centralia Reach. Hydric soils are extensive as well, indicative of either past hydrologic conditions or current conditions. The wetland and hydric soils are interspersed with broad areas of non-hydric soils (Corps 2002). The wetland complexes are less extensive along the Skookumchuck since the floodplain is smaller. Wetlands in the lower Skookumchuck floodplain were apparently part of a large system that has been almost completely altered by urban development (Corps 2002a).

Wetlands are important to fish and wildlife for many of the same reasons discussed in the section on riparian areas above. Johnson and O'Neil include riparian areas and riverine wetlands together in the same category in terms of their value for wildlife (2001). These areas are protected legally, but have declined in areal extent and quality over the years.

Johnson and O'Neil separate riverine wetlands and herbaceous, isolated wetlands, which include all freshwater aquatic bed habitats in isolated areas that are not hydrologically connected to drainages such as oxbow lakes, wet meadows, or potholes. Dominant plant species include various grasses or grass like plants such as cattails, bulrushes, sedges, and spike rush. Habitats are maintained in these isolated wetlands through hydrologic regimes that exclude colonization by large woody plants. The wetlands and oxbows in the project area are valuable habitat for a variety of wildlife, particularly waterfowl. Due to recent court cases, these areas have lost much of their legal protection federally, although they may be protected locally in some areas. Isolated wetlands have also declined in areal extent and quality over the years.

The SR-6/Scheuber Ditch proposal could result in improved wetland function, better hydrological connections to wetlands, and increased habitat value of wetlands in this area. The re-operation of the dam may decrease wetland function, areal extent and value to fish and wildlife by eliminating the hydrological connections to wetlands that will no longer flood under this plan. The Corps states that 34 acres of wetlands will be lost due to construction of the levees. Most of that loss is of emergent or prior converted wetlands. Although the Corps has updated the National Wetland Inventory maps that indicate the location and type of wetlands found in the

project area, site-specific information about the location, type, function, extent of these wetlands is still uncertain.

COVERAGE OF RESOURCE TOPICS

We are aware that the upper watershed is degraded and that this affects conditions in the lower reaches of the Chehalis River and its tributaries. However, we limited our geographic coverage to the project area for the following reasons: 1) the Corps has limited the scope of their study to the project area; 2) scientific literature supports the idea that restoration of alluvial reaches of rivers and floodplain function makes good ecological sense even when conditions in the upper watershed are still degraded; and 3) the state's limiting factors analysis has identified the main stem Chehalis, Skookumchuck, Newaukum, and South Fork Chehalis Rivers, all in the project area, as high priority sub-basins for remediation or restoration actions. This selection is based on the number of salmonid stocks and stream miles with known steelhead and salmon presence (Smith and Wenger 2001).

Although the following issues are considered limiting factors for salmonids in the upper Chehalis Basin, we have discussed them only minimally in this report. Our reasons for excluding these topics from detailed discussion include the following:

- 1) Fish passage barriers are not a significant problem in the main stem of the Chehalis River or the larger tributaries in the project area. We do discuss fish passage issues relative to the Skookumchuck Dam.
- 2) We have only minimally discussed water quality problems, which are well documented by the Washington State Department of Ecology (WDOE). The flood project could indirectly affect water quality by altering low flows or the buffering capacity of riparian vegetation, however we do not believe these impacts will occur to a significant extent.
- 3) We have only minimally discussed low flows, which are also well documented by the WDOE. WDOE is currently revisiting minimum flow standards for the Chehalis River. We have made the assumption that base flows could be improved by increasing the quality and areal extent of riparian conditions, restoring floodplain function, and maximizing the opportunity for wetland and aquifer recharge to take place.

RESOURCE PROBLEMS, PLANNING OBJECTIVES AND OPPORTUNITIES

Our major resource concerns for this project are organized into two categories: 1) alterations to physical processes that create or maintain aquatic salmonid habitat, including altered hydrology, disconnected floodplain (or channel incision); altered sediment supply and transport, and altered large woody debris availability and transport; and 2) alterations to terrestrial habitats important to fish and wildlife, and 3) direct impacts to species, particularly anadromous fish. We have discussed our resource concerns throughout this report.

We had three objectives for planning for this project. Our first objective, consistent with mitigation sequencing was to ensure that the alternative selected would be the least environmentally damaging. Mitigation is defined as a sequential process that seeks to: 1) avoid adverse impacts; 2) minimize impacts that can not be avoided; and 3) compensate for unavoidable impacts. By concentrating on the alternative selection process, we felt that many adverse impacts could be minimized up front or avoided altogether.

Our second objective was to define the potential impacts to the resources listed above that could result from the various alternatives being evaluated. In the initial evaluation and studies, certain alternatives appeared to involve more risk to the environment than others. If those higher-risk alternatives were to go forward for further consideration, we recommended more detailed studies to quantify those risks.

Our third objective was to identify projects that could serve as compensatory mitigation for unavoidable impacts or that might be incorporated as restoration projects to enhance conditions for fish and wildlife. The projects were based on our understanding of what is needed in the project area to improve habitat or habitat forming processes.

During our participation, we identified numerous opportunities to improve habitat conditions for fish and wildlife in the project area. These actions include, but are not limited to: restore riparian, floodplain, and wetland areas; increase plant diversity; increase remnant habitat areas and improve connection to other habitats; remove fill from historic wetland areas or floodplains; re-connect oxbows, wetlands, and old meanders; roughen the channel through addition of large woody debris, particularly log jams; remove or setback existing levees; remove drainage systems (drain tiles or ditches); operate the Skookumchuck Dam to mimic natural hydrologic flows; increase floodplain and wetland recharge areas; implement a “no net loss” policy for the floodplain (i.e., no import of fill in the floodplain); and protect existing floodplains, wetlands and off-channel habitat through land use regulations, conservation easements, or other nonstructural measures.

EVALUATION METHODS

One of the questions that arose repeatedly was how to assess the potential interaction between the proposed flood alternative and river morphology and geomorphic processes. A geomorphology analysis was conducted that involved four components: 1) aerial photographic analysis from multiple photo years; 2) field reconnaissance; 3) sediment characterization; and 4) sediment transport analysis. These four components were synthesized into a conceptual model to describe morphology and geomorphic processes within the project area (Cherry 2001a).

Studies conducted to help establish a baseline and assess impacts of this project include: 1) a literature review on geomorphology that takes a historical and physical perspective on the habitat conditions in the project area and the factors responsible for them (Cherry 2001); 2) an evaluation of riparian conditions, stream channel configuration and complexity based on a comparison of aerial photos taken in 1938 and 1999 and field visits (SAIC 2001); 3) a fish and

wildlife habitat study based on field surveys and aerial photos that maps spawning areas, wildlife habitat features, channel structure, off-channel habitat areas, riparian condition, and the recruitment potential for LWD (PIE 2001); and 4) a wetland report based on an update of the National Wetland Inventory and riparian vegetation mapping done through aerial photo interpretation and field surveys by USFWS and the Corps, the Lewis County soil survey, and analysis of wetland function based on a hydrogeomorphic assessment methodology developed the Washington State Department of Ecology (Hruby et al. 1999).

To understand baseline conditions of resources in the Upper Chehalis Basin, we conducted site visits, talked to resource experts familiar with the Chehalis Basin, participated in the planning of the Centralia Flood Study, and consulted the literature available about this area and the issues identified as problems in this area. Our literature review also included a search for information about impacts from traditional flood projects (dams, levees, and flood bypasses), and approaches to flood hazard reduction that include restoration, engineered log jams, and restoring incised rivers.

We participated in the Corps' Restoration and Flood Control Evaluation Methodology as part of the evaluation process for this project. This methodology was similar to that developed in the Bellingham Bay Pilot Project and the Green/Duwamish River Basin Restoration Program (Anchor Environmental 2000 and Ging 2000). These projects relied on an evaluation of both process-based and site-specific habitat conditions and how those could change with the project. They also focused on specific habitat requirements for threatened and endangered salmonids.

The Corps' evaluation framework for the Centralia Flood Study assesses two scales of impact or benefit: 1) effects on watershed-level processes and limiting factors; and 2) effects on local habitat quality. The framework assessed the effects of 18 restoration projects and 7 flood control alternatives on these factors. The methodology relies heavily on existing information, particularly the Limiting Factors Analysis (Smith and Wenger 2001) and best professional judgement by an expert panel with experience in the Chehalis River basin. Also important for some aspects of this evaluation process were the results of surveys done by Pacific International Engineering on fish and wildlife habitat (PIE 2001). The watershed-level processes or limiting factors as they are called include: a) an altered hydrologic regime; b) loss of floodplain connectivity; c) altered sediment supply and transport; and d) loss of riparian zone and LWD. The local habitat factors or site specific conditions include alterations to: a) spawning habitat; b) rearing habitat; c) water quality; d) wetlands; e) habitat complexity/connectivity; f) species diversity; and g) fish passage.

Under the evaluation framework, the expert panel ranked the functioning of each of the factors listed above for selected sub-basins in the project area. Based on a consensus, each factor was given a score to rank baseline conditions. These scores were then adjusted by the group to estimate how the scores would change given various flood or restoration projects. The expert panel consisted of representatives from the Corps, the US Fish and Wildlife Service, the US Environmental Protection Agency, the Washington Department of Fish and Wildlife, the Washington Department of Ecology, and the Washington Department of Transportation. More specific studies are planned for the next phase of the investigation, including a geomorphic and sediment study to help determine the significance of impacts in the Skookumchuck River

due to altered flows. In addition, wetland studies and a habitat evaluation program (HEP) may be needed to better quantify impacts to wetlands and terrestrial species. These studies would be used to develop a mitigation plan.

FISHERY RESOURCES

Salmonid stocks in the Chehalis basin include spring, summer, and fall chinook, chum, coho, summer and winter steelhead, bull trout/Dolly Varden, coastal (anadromous) cutthroat trout, and a great multitude of resident rainbow and cutthroat trout. There are no pink or sockeye stocks in the Chehalis (WDFW 2000, 1998, and 1994). Many of these stocks are found in the project area or could be affected by flood control projects in the project area.

Skookumchuck Dam is a block to anadromous fish passage. With the exception of winter steelhead, the anadromous salmonids known to use the Skookumchuck River are only found downstream of the dam. Steelhead are captured at a trap and haul facility and relocated upstream of the dam to spawn and rear (See our comments about fish passage at the dam under the Resource Concerns Section, Fish Passage). Resident cutthroat trout are known to spawn upstream of the dam. Downstream of the dam, fish resources include spring and fall chinook, coho, winter steelhead trout and anadromous and resident cutthroat trout. A chum salmon run that formerly occupied this sub-basin is now considered extinct (Corps 2002a).

CHINOOK SALMON

The spring chinook is managed for wild production with 90% of the spawning occurring in the Skookumchuck, Newaukum, and upper main stem Chehalis Rivers (WDFW 1994). Although the one summer chinook stock is primarily observed in the Satsop River, it has also been observed in the upper Chehalis Region. One of the fall chinook stocks (the Chehalis) occurs upstream of the confluence with the Satsop River tributary (Smith and Wenger 2001). Fall chinook occur throughout the upper basin, including the Black and Skookumchuck Rivers, and the Cloquallum and Porter Creeks and to a lesser extent, the Newaukum and South Fork Chehalis Rivers, and the Cedar and Stillman Creeks (WDFW 1994). The 1992 Washington State Salmon and Steelhead Stock Inventory (SASSI) states that both fall and spring Chehalis chinook are healthy stocks (WDFW 1994) with similar trends in the last decade (Smith and Wenger 2001).

CHUM SALMON

The Chehalis chum stocks are considered “wild” and “native,” and although they are considered healthy, their numbers have declined over time. The Chehalis stock spawns in WRIA 22 and 23 (Smith and Wenger 2001). Chum salmon are found throughout the lower Chehalis River tributaries, and main stem Chehalis and Black Rivers, Cloquallum Creek and tributaries. Chum use these areas and side channels and/or spring or seep-fed sloughs for spawning. (WDFW 1994). Despite their occurrence primarily in the lower basin, chum occurring downstream of the project area could be affected by alterations to the flow regime, and sediment, nutrient or wood routing.

COHO SALMON

The Washington State Department of Fish and Wildlife has estimated coho production in the Chehalis River system for the last 20 years. Estimates are based upon annual trapping and tagging of wild smolts and sampling adults in the lower Chehalis River for coded-wire tags. The Chehalis River System produces the highest number of wild coho smolts of any coastal drainage (Seiler 2002). The Chehalis River coho are both wild and of hatchery origin. The Chehalis coho stocks spawn upstream of the confluence with the Satsop Rivers. Coho spawning occurs in the upper main stem, the main stem west and east forks of the Chehalis River, and in all suitable, accessible tributaries, including the Skookumchuck and Newaukum Rivers. The Chehalis coho stock was considered healthy in the 1992 SASSI (WDFW 1994). Average escapement in the upper Chehalis basin has dropped 20% in the last decade (Smith and Wenger 2001).

STEELHEAD TROUT

Little is known about spawning locations for summer steelhead, but the Chehalis stock is presumed to spawn in the upper Chehalis River. Two stocks of winter steelhead spawn in the project area: the Skookumchuck/Newaukum and the Chehalis (all spawners upstream of the confluence with the Satsop except the Skookumchuck and Newaukum Rivers). The Skookumchuck/Newaukum winter steelhead stock is considered depressed (WDFW 1994, Smith and Wenger 2001). The latter stock is considered a composite of hatchery and wild origin. Spawning of winter steelhead occurs in the main stem, and the smaller creeks and tributaries (Smith and Wenger 2001, WDFW 1994).

BULL TROUT/DOLLY VARDEN

As of 1998, the WDFW identified a distinct subpopulation of bull trout/Dolly Varden in the Chehalis River/Grays Harbor system. This native char was believed to occur in tributaries west of and including the Satsop River and may include the anadromous, fluvial and resident life histories. Adult char have been found in the estuary and lower tributaries of Grays Harbor, however a recent review of 11 years of records from downstream migrant traps, beach seining, and adult traps found no confirmed native char in the Chehalis River Basin (USFWS 2000a). Most of the upper Chehalis Basin is relatively low gradient, and many areas have water temperatures that exceed state standards, conditions that are not ideal for native char. Some areas in the upper watershed have been identified as having potential bull trout spawning habitat, although no bull trout have been observed. The Chehalis Basin and Columbia Rivers probably represent the southern end of the range of anadromous char on the west coast (WDFW 1998).

COASTAL CUTTHROAT TROUT

The southwestern Washington-lower Columbia River region, which includes the Chehalis Basin, historically supported healthy, highly productive populations of coastal cutthroat trout. Coastal cutthroat trout are present in nearly all tributaries and main stem reaches in one or more life history forms. Anadromous forms and fluvial forms inhabit main stem and accessible tributary reaches. Resident life history forms exist above fish barriers, such as the Skookumchuck Dam. Adfluvial forms live in most lakes throughout the basin (WDFW 2000).

Hatchery releases of cutthroat have been made throughout the basin, however most hatchery programs for cutthroat have been discontinued (WDFW 2000).

Although in some areas freshwater forms of coastal cutthroat remain healthy, rapidly declining numbers of the anadromous life form are considered a risk factor for coastal cutthroat trout in the Southwestern Washington/Columbia River ESU (NOAA 1999). Coastal cutthroat in the Chehalis Basin are a species of concern under the federal Endangered Species Act. Anadromous fish are important in maintaining genetic connectivity and reducing risk of extirpation of isolated populations. Freshwater, resident forms may be abundant in many streams, and may produce smolts that migrate downstream and become anadromous, provided habitat conditions allow their survival in the lower reaches of streams and near shore marine environments. However, this type of production has not successfully increased populations of anadromous forms (NOAA 1999).

NON-SALMONIDS

The Chehalis Basin is rich in fish species compared with other drainages in Puget Sound. Species richness in the Chehalis basin is related to the large size of the basin, the low gradient and the fact that the Chehalis River basin was not glaciated during the last ice age. The Chehalis, known as “the Chehalis Refuge” was the largest river left free of ice in Western Washington during the last ice age. As the ice melted, fish dispersed from the Chehalis River outward. There are 34 species of native fish in the Chehalis basin (Mongillo and Hallock 1997).

WILDLIFE AND BOTANICAL RESOURCES

The project area lies within the Puget Lowland Ecoregion as described by Johnson and O’Neill (2001). This area encompasses a range of conditions arising from geology and geological history, soils, topography, climate (past and present) and precipitation that support different vegetation communities and habitat for many species (2001). Habitats for this area include: 1) westside lowland conifer-hardwood forests; 2) westside riparian and wetland; 3) open water - lakes, rivers, ponds and reservoirs; and 4) agricultural, pasture and mixed environs. Small remnants of Westside oak and dry Douglas fir-woodland forests, westside grasslands (remnant prairie), and herbaceous wetlands are also found in the project area.

WESTSIDE LOWLAND CONIFER/HARDWOOD FORESTS

This habitat is the most extensive in western Washington and forms the matrix within which other habitats occur as patches, most important of which are the riparian, wetland, and open water habitats. Dominant tree species include western hemlock, Douglas fir, western redcedar, red alder or bigleaf maple. Dominant under story shrubs include salal, Oregon grape, vine maple, and salmonberry. Large areas of this habitat exist, although most of it is second growth Douglas fir, with few snags or downed logs. Forested areas are prevalent in the upper watershed, or as patches of forest within agricultural and rural residential areas in the floodplains.

Forested areas provide habitat for hawks, owls, woodpeckers, songbirds, and small mammals. Elk and blacktail deer inhabit the lower areas of the watershed.

WESTSIDE RIPARIAN/WETLANDS

This habitat exists in patches or linear strips along streams and in wetlands, oxbows, backwater areas and ponds or in areas within the floodplain. In forested areas along streams, the deciduous plant species include black cottonwood, red alder, and big leaf maple with an under story that includes such shrubs as snowberry, red osier dogwood, and Indian plum. Coniferous species include western red cedar, western hemlock, Douglas fir and Sitka spruce. Common understory shrubs include salmonberry, vine maple and salal (SAIC 2001).

Wildlife depending upon these aquatic habitats and transition zones include river otters, muskrats, beaver, great blue heron, belted kingfisher; and amphibians and reptiles such as salamanders, newts, toads, frogs, turtles, lizards and snakes. Deer, bear, and coyote use riparian and wetland areas for hiding and refuge as well as travel corridors. Small mammals such as raccoons, beaver, mice and voles breed and rear young in dense riparian vegetation. Resident waterfowl and upland gamebirds probably use riparian areas for foraging, breeding and rearing. (PAL 1989). Migratory waterfowl, such as mallards, teal, pintails, and widgeon use the oxbows, slackwater areas and ponded areas as stopovers for resting and feeding (WDFW 2001).

AGRICULTURAL, PASTURES AND MIXED ENVIRONS

Much of the floodplain in the project area is in agricultural or rural residential use. Lack of connectivity is one of the biggest problems for wildlife in agricultural and rural residential areas. Repeated cultivation limits the habitat value of agricultural areas, although forbs and grasses provide forage for wildlife after crops are harvested. Upland shrub vegetation is found in many areas that have been disturbed by past human usage, such as grading, logging, or agriculture. Vegetation characterizing these areas includes vine maple, Himalayan blackberry, salal, snowberry, trailing blackberry, reed canary grass, bracken fern, and quackgrass.

Pooled flood water that is contained in agricultural floodplains is valuable for waterfowl during the winter and spring months. Generally, unimproved pasture has a high value for wildlife although areas that grow corn or other grain, are in pasture, or cultivated for hay provide valuable holding and feeding habitat for wintering waterfowl and shorebirds and the raptors that forage on them. The borders between fields, alongside roads and along wetlands and streams can provide cover, forage and nesting habitat for many species.

Urban areas encompass low density housing to high density urban land use with a high percentage of impervious surfaces. Similar to agricultural land that is highly altered and cultivated, habitat in urban areas tends to be concentrated in patches along streams or wetlands, or alongside roads. (Corps 2002).

The forbs and grasses provide forage for wildlife after crops are harvested. These areas support songbirds, small mammals, and other wildlife, such as blacktail deer, robins, and song sparrows. Open fields associated with the floodplain support small mammals, which attract a significant number of predators. Raptors in the project area include red tailed hawk, northern harriers, and American kestrels and many other raptors probably use the area as residents or during migration.

PRIORITY SPECIES

The project area supports numerous species meriting conservation and protection that have been identified by either federal or state fish and wildlife agencies. Species listed as threatened under the Endangered Species Act (ESA) by the federal government include the bald eagle, marbled murrelet, Northern spotted owl, bull trout, and golden paintbrush. Candidates for federal listing and species of concern include the coho salmon, coastal cutthroat trout, Mardon skipper; western pocket gopher; tailed frog; Van Dyke's, Olympic torrent and Columbia torrent salamanders; Pacific lamprey; and Western gray squirrel. Plant species of concern include tall bugbane and white-top aster.

Other species that may be found in the action area warrant special protection because they are either listed, proposed for listing, candidates for listing, or species of concern under state law. These species include the great blue heron, Olympic mud minnow, band tailed pigeon, wood duck, bufflehead, osprey, Paca butterfly, spotted frog, long eared myotis, olive-sided flycatcher, and western pond turtle. The Olympic mud minnow, a Washington State Sensitive Species, is found in only a few locations in Southwestern Washington. This species has been identified in the "Chehalis Reach" i.e., between the cities of Chehalis and Centralia.

Amphibian species generally are dependent upon winter charging of wetlands along river areas, and amphibian species richness is greatly influenced by the amplitude of floods and recharging of wetlands. Rapidly changing flows can affect amphibians. Specifically, the alteration of flood flows that recharge wetlands could affect Oregon spotted frogs, a federal candidate for listing under the ESA. There are two known populations, one in Thurston County and one in Klickitat County. There is believed to be potential habitat in the Centralia/Chehalis area. The range of this species used to be very large and it is possible that a population could exist in the project area in the Chehalis drainage (K. McAllister, WDFW, personal communications 12-27-01).

The Washington State Department of Fish and Wildlife identifies the following important fish and wildlife resources in the project area: regular, large concentrations of waterfowl, mink, breeding occurrences of cavity nesting ducks such as harlequin ducks and wood ducks, great blue heron, osprey, and bald eagle. The area is in the winter range for Roosevelt elk. Reported in the upper parts of the watershed have been breeding populations of osprey and bald eagle, tailed frog, Cope's giant salamander, and the Cascade torrent salamander. The upper watershed, including Lincoln Creek and the Upper Chehalis, have occurrences of Roosevelt elk, breeding occurrences of golden eagle, and Dunn's salamander. There have also been observations of tailed frog, marbled murrelet, spotted owls, Vauk's swift, great blue heron, cavity nesting ducks, bald eagle and osprey in the upper watershed of the Newaukum River and its tributaries.

The project area encompasses important overwintering areas for waterfowl, shorebirds and the raptors that depend upon these migrants for food. Waterfowl observed include mallards, pintails, wigeon, teal, mergansers, scaup, buffleheads, goldeneyes, and Aleutian, dusky, white-fronted, cackler, and Canadian geese. Also seen are less common visitors such as redheads, canvasbacks, cinnamon teal, and snow geese. Numerous shorebirds feed in the ponded areas after flooding. Raptors observed include the bald eagle, kestrel, peregrine falcon, and rough-legged, Swainson's, marsh, and red-tailed hawks. Important areas for these birds during flooding season

include the Big Hanaford Valley, the Centralia Reach and golf course, Stearns Valley, and to a lesser extent Newaukum Valley. Sand hill cranes and up to 200 swans have also been observed (S. Hager, USFWS biologist, pers. comm. 5-20-02).

ESA CONSULTATION

The Corps has prepared a Biological Assessment that discusses the occurrence of federally-listed species, their use of the project area, and the expected effect of the project on them. Species that could be affected by the project include the bald eagle and bull trout. The Corps determined that the proposed project may affect but is not likely to adversely affect these species. Based upon the location of bald eagle nest sites and bald eagle use of the project area and the low probability of bull trout presence in the upper Chehalis River basin, the Service concurs. The Service issued a concurrence letter for the project dated October 22, 2002.

ALTERNATIVE SELECTION PROCESS

The alternative selection process started off with ten screening criteria for an alternative to be carried forward for consideration. These criteria included: reduce flood hazards, decrease transportation closures, avoid increasing flood risks hazards downstream, avoid decreasing existing low flow benefits provided by Skookumchuck Dam, reduce flood damage and transportation delay costs, be cost effective, avoid, minimize and compensate for unavoidable adverse impacts, incorporate fish and wildlife habitat enhancement elements, and comply with environmental regulations. The alternative selection process started with seven alternatives:

- 1) No action alternative
- 2) Skookumchuck Dam modification (authorized in 1986 but not economically justified)
- 3) Overbank excavation and flow way bypass (Lewis County Alternative)
- 4) Levee system
- 5) Upstream flow restriction structures
- 6) Nonstructural alternative
- 7) Interagency alternative

For Phase 1 screening, the Corps weighed these seven alternatives against the project criteria, primarily insuring that remaining alternatives would reduce the risk of flood hazard, meet cost benefit criteria, and avoid and minimize environmental impacts. As the result of this screening, the Corps came up with four alternatives for further evaluation:

- 1) No action
- 2) Floodplain modifications (Lewis County alternative)
- 3) Levee system
- 4) Interagency alternative

As part of Phase 2 screening, the Corps used a hydraulic and economic model to select the National Economic Development (NED) plan. The levee system met this second phase screening. A preliminary geomorphic evaluation, based on concerns raised by the Service and

other natural resource agencies about the environmental risks of the Mellon Street bypass, selected the levee system as the least environmentally damaging alternative.

After determining that the levee system provided the NED plan, the Corps compared flood reduction benefits and costs of various modifications of the dam. 1) One modification, the “high dam” would increase pool storage from elevation 477 feet to elevation 492 for flood storage of 20,000 acre feet and modify the outlet works to provide better control over release of water from the reservoir at elevations lower than 477 feet. 2) The second choice, the “low dam” would be to make changes in the outlet structure only for flood storage at 477 feet of 11,000 acre feet. The Corps found that there is little difference in the flood reduction benefit between the two approaches but that there is a much larger cost associated with the increase in pool elevation, so that the high dam was not economically justified. The low dam, which meets the Corps NED plan, is also the recommendation of the Interagency Workgroup that developed the interagency alternative.

From the beginning of our involvement, we had concerns about the short time frame for planning and the momentum of the “Lewis County Alternative” (the floodplain modifications, especially the Mellon Street bypass). We were concerned that the Mellon Street bypass would be selected as a preferred alternative before other alternatives had been fully developed. Resource agencies raised many questions about potential impacts and their concern that other alternatives would not be given adequate consideration. The contractor for the local sponsor prepared a fish and wildlife habitat study that focused on areas that would be potentially affected by the Lewis County alternative. We were given no opportunity to provide input or to become involved with implementation of the study, although we did provide comments once the study was completed.

In response to continued concerns raised about the short time frame and potential impacts to channel processes of the Mellon Street bypass, the Corps provided several helpful changes to their planning. First, they improved the process so that it was more inclusive and communicated better with various stakeholders. Secondly, the Corps provided a geomorphic evaluation of all the alternatives being considered. That evaluation concluded that the levee alternative would have insignificant impacts to channel processes in comparison to the Mellon Street bypass. The report concluded that sufficient geomorphic information had been obtained to select a “least environmentally-damaging alternative,” i.e., the levees, but that should the Mellon Street bypass be selected, more detailed sedimentation and geomorphic studies should be undertaken to help quantify impacts to physical processes and help establish appropriate mitigation measures. Because of the short time frame, these studies could not be completed in time to keep the project on schedule for WRDA 2002 funding.

In following its planning process, the Corps selected the levee alternative with “low” dam modifications as its NED plan. In addition, early evaluation indicates that this alternative is the least environmentally damaging, a conclusion with which we agree. The Corps later selected the “high dam” option for the recommended plan. Operational restrictions are expected to keep the environmental impacts of the “high dam” option similar to that of the “low dam.”

FUTURE WITHOUT THE PROJECT

Conditions in the upper watershed of WRIA 23 should improve gradually with time. We expect to see this improvement because of re-establishment of riparian vegetation, an increase of large woody debris recruitment, a reduction of suspended sediments from upstream sources, and possibly some normalizing of the hydrograph (i.e., with better forest recovery and road drainage standards, we would expect to find greater evapotranspiration and interception of infiltration of precipitation and less connection of road surfaces to stream channels, resulting in increased runoff lag times).

We expect these improvements would result from several actions, including: 1) a habitat conservation plan (HCP) completed for state-owned (Washington Department of Natural Resources) forest lands; 2) revised forest practice rules, applicable on all private forest lands, which should result in improved riparian conditions, better potential for LWD recruitment, and reduction of fine sediment input to streams; and 3) road maintenance and abandonment plans which will be required on all forest roads within the next five years, and should result in fewer debris torrents and decreased inputs of sediment into the upper basin (M. Ostwald, USFWS, personal communication 4-24-02). The beneficial results of these actions could be dampened by the magnitude of channel incision and erosion in some reaches, such as the North Fork Newaukum River. Erosion increases sediment input locally despite improved conditions from headwater areas (Bakke 2002).

We expect to see an improvement in water quality with time under the TMDL process. We are uncertain of the degree of seepage from the contaminated sites in the project area and the plans for clean up or containment. We are also uncertain about the plans for improvement in sewage treatment plants, stormwater management by the cities, and improved dairy practices and food processing practices. Our assumption is that over time, and with the states' continued setting of standards for these water-quality-related issues, water quality will improve to some degree.

Currently the state's Salmon Recovery Funding Board and the federal Chehalis Basin Fisheries Restoration Program are funding salmon restoration projects throughout the basin. These typically average about 7 projects per year for each program. Types of projects include livestock exclusion, fish passage, riparian planting and, in the case of the state program, land acquisition and assessments. The federal program funds smaller projects, generally, than the state program (B. Peck personal communication 4-25-02). We would expect these projects to incrementally improve conditions for salmonids in the tributaries, although the effects on conditions in the project area are uncertain. We would expect the improvement to be most marked in the area of retrofitting culverts and fish passage barriers to provide better access to functioning habitat.

As part of the state's salmon recovery response, the watershed planning process is now underway in the Chehalis Basin. This process focuses on water rights, determining whether water is over-allocated, and the water needs for fish. Although the state is conducting studies this year to determine the flows needed for fish, the watershed planning process is controversial, and it is uncertain what the effect will be on water in the basin long term. The state has instituted new water policies that may show a positive effect over the years, but these are voluntary, including a program that encourages people to conserve water rather than "use it or lose it." The other

program pays people not to use water so that it will be available for fish. It is uncertain whether funds will be available for that program in future years or whether the water reserved in this manner will actually stay in the channel. Our assumption is that without a major change in how water rights are allocated, we do not expect to see major changes in the amount of water available for fish.

Our understanding is that without the project, the state's Department of Transportation would raise the freeway in the project area to reduce flooding and closure of the freeway. It is uncertain what the long-term effect of this would be on ecological functioning. The ecological conditions in the project area will depend largely on the amount of filling and type of development allowed to occur in the floodplain and floodway. The Corps states that Lewis County will adopt the new 100 year floodplain maps with floodways and flow paths marked on them, although we do not know when this will take place. Provided the county uses these maps and enforces regulations regarding development of floodplains, floodways and flow paths, we would expect conditions to remain fairly constant, in other words, degraded but probably not getting worse.

Without the project, and without a commitment to a floodplain management plan and land use and development regulations, we would expect to see development continue to some degree in the floodplain and floodways as has occurred in past years. Habitat for fish and wildlife would continue to be lost. Although future development would be limited by flooding, it has been allowed to occur in the past through imported fill and local diking practices. These practices result in cumulative channel simplification, continued loss of floodplain storage, degradation of riparian vegetation and wetlands, flashy hydrology, fine sediment input, and degradation of or lack of opportunity for re-creation of off-channel habitat and spawning and rearing habitat. Increases in impervious surfaces can be expected to exacerbate flashy hydrology, especially in smaller sub-basins, with associated increases in erosion and fine sediment input and proliferation of bank armoring projects. Recent court cases have challenged the Corps of Engineers and a state's authority to regulate filling of isolated wetlands. We expect to see an erosion of protection for isolated wetlands because of these legal challenges and increased filling of isolated wetlands.

Because significant changes in agricultural practices to benefit fish and wildlife have been difficult to regulate in Washington, it is difficult to predict future conditions in this area as well. Voluntary measures, restoration projects, and incentives are available that encourage farmers to exclude livestock from streams, plant riparian buffers, and restore wetlands. Land acquisition, incentive programs such as the federal Conservation Reserve Enhancement Program (CREP), and conservation easements would have a long-term beneficial effect, but it is difficult to determine how widely these programs will be used.

We would expect to see many areas of the floodplain continue in agricultural use. Currently agricultural fields that are seasonally flooded provide important foraging habitat for wintering waterfowl, shorebirds and the raptors that depend upon them. We would expect to see these floodplain agricultural areas continue to provide important wildlife habitat into the future as well.

Currently, large wood is removed from the river and streams by local residents. Without some educational or regulatory program in place, we would continue to see large woody accumulations disappear from the stream channel. Without the presence and retention of large woody debris, we

doubt that the river incision and channel simplification will change much in the future. Based on studies provided by the Corps (SAIC 2001), the extent of channel migration has not changed much in the last 60 years; channel incision and channel simplification have appeared to worsen over time. We would expect to see continued bank erosion, bed scour, and high, bare banks unless the river accumulates large woody debris and riparian vegetation.

SKOOKUMCHUCK DAM AND SKOOKUMCHUCK RIVER

We expect that without alterations to the operation of the dam, existing conditions would continue into the future. A 15-foot zone with no vegetation would continue to exist around the perimeter of the reservoir. Juvenile salmonids and, perhaps, amphibians and small animals, would benefit from the presence of shoreline vegetation when the pool elevation is high during the late winter and spring. The exposed substrate would continue to provide no cover, foraging or shade for fish and wildlife during the summer through fall when the reservoir is low.

Fluctuations in water levels will continue to leave the delta areas of tributaries in a state of constant degradation.

Fish passage around the dam would continue as currently. However the success of the current trap-and-haul and smolt out-migration for steelhead has not been evaluated. We are uncertain whether the water out take for the power generation facility has fish screens or, if present, whether they are successful at preventing injury to fish from entrainment.

Some aspects of habitat in the Skookumchuck River would no doubt remain the same or improve slightly. Continued dam operation to provide minimum flows and temperatures for fish spawning and rearing would result in future conditions that are similar to the present. Water quality would probably improve as the TMDL process continues. As the valley continues to develop, we would expect to see new bank armoring projects and local diking projects for erosion and flood control. Because the source of coarse sediments to the river is derived from bank erosion and tributaries, further bank armoring may reduce the supply of spawning gravels and create larger areas of bedrock, depending upon where the armoring takes place. Channelization may also contribute to greater losses of off-channel habitat, channel incision, redd scour, excessive sediment and LWD transport, and fish stranding during overbank flows.

FUTURE WITH THE PROJECT

UPPER CHEHALIS RIVER BASIN

Future “with project” conditions depend largely upon how well the Corps, local sponsor, and involved parties develop details about the following elements: mitigation, monitoring and adaptive management, the SR-6/Scheuber Ditch project, restriction of development riverward of the levees, design of the levee system, and restoration projects. With attention to how these elements are designed and implemented, we believe that the recommended plan could result in improved conditions for fish and wildlife in the Centralia Reach.

The levee system may contribute to improved water quality with time. It is being designed to contain contaminants on state or federal superfund sites that currently seep into the river.

We would expect to see more dense development occur outside the levee system as urban areas are protected from flooding. Without having a clearer idea about how nonstructural measures will actually be implemented, we are uncertain as to the future conditions of the land on the river side of the levees. Common sense would indicate that frequent flooding should limit urban development, however it has not done so in the past. Use of imported fill and local diking have enabled development to occur in the floodplain, resulting in loss of flood storage and natural floodplain function. It appears that local jurisdictions may allow commercial development in designated “floodways.” If commercial development continues to encroach upon floodplain areas, it will limit the natural functioning of the floodplain and the value for fish and wildlife that makes the concept of setback levees so appealing.

According to documents provided by the Corps, the SR-6/Scheuber Ditch mitigation project will improve habitat for both fish and wildlife in the Centralia Reach. To what degree it will constitute an enhancement above and beyond mitigation for project impacts is uncertain. Implementation of restoration projects conceptualized in the Draft Restoration Plan may ensure that fish and wildlife habitat would improve in the future.

SKOOKUMCHUCK RIVER BASIN

As described in the fisheries review document, dam re-operation would result in an alteration of flows in the Skookumchuck River. We lack the information to predict the impacts of altering flows. We suspect that we might see fewer off-channel habitats accessible by fish, different species use of spawning gravels, degraded spawning beds, a riparian system that is less dynamic than currently with less species diversity and more exotic species invasion. With fewer overbank flows, fines may be passed down the river instead of being deposited on the floodplain with a resulting increase of turbidity downstream. Erosion may increase in certain areas, and bank armoring in response could also increase. Channel incision, particularly in areas with existing bank armoring, could increase. It is unknown how significant the long-term impacts might be. If the sediment and geomorphic studies proposed by the Corps indicate that these impacts are significant, it is unknown how the Corps would mitigate for them.

The environmental impacts of the “low dam” versus “high dam” alternatives are basically the same provided that the slide gates do not retain water at the higher (“high dam”) pool elevation for longer than five days and that the high dam elevation is not used more than once every other year. Limiting the duration and frequency that the pool would be allowed to remain at elevation 492 feet would reduce the loss of shoreline vegetation due to long-term inundation.

Having freshets pass through the dam during the fall and winter may benefit fish downstream by triggering spawning and overwintering behavior, however it is difficult to say whether the benefits would outweigh the impacts to habitat from the dam re-operation. We are uncertain how alterations in fish passage at the dam might ultimately affect winter steelhead.

DISCUSSION

SETBACK LEVEES

We support the Corps' selection of setback levees as the least environmentally damaging alternative. We understand that: a) for the most part, the levee system would consist of an increase in height of existing levees or embankments; b) that new levees will be located close to developed areas and that undeveloped floodplains will be allowed to continue to flood; c) that there may be some reduction in flood storage at the largest events; d) that there will be little change for smaller, more frequent flood events; and e) that most areas protected from flooding probably did not function well for recharge or habitat because they are covered with impervious surfaces.

Based on the Corps' hydraulic modeling and the geomorphic evaluation, we would expect that the setback levees by themselves will have little effect on riverine or floodplain functions for most flood events. Although the areal extent of flooding would change significantly for events larger than a 2 year, the predicted rise in flood stage is minimal, even at the 100 year event. Downstream, the rise in flood stage would be much less. This effect is probably due to the Mellon Street Bridge, which acts as a "pinch point," retaining flood waters despite the decrease in flood storage resulting from the levees. In addition, the increased flood storage of the SR-6/Scheuber Ditch proposal may partially offset the loss of flood storage due to levees at certain events, although we do not know to what degree.

Aerial photos indicate that the river has not meandered much in the last 50 years. The levees are set back from the river channel so that in the future, should restored functions allow more meandering, the river would not be significantly constricted in most places. The floodplain areas would continue to function as natural floodplains.

Based on information from Corps hydrologists, it appears that groundwater recharge from large scale floods contributes minimally to continued base flows in this area. Whatever ground-water recharge takes place during flood events within an urban area is greatly altered because of impervious surfaces. Removing these areas from flooding should not significantly affect base flows in the Chehalis River. Removing agricultural drain tiles in some of the areas that will continue to flood would improve groundwater recharge and could improve the natural functioning of this floodplain.

The levees will cause significant unavoidable loss to wetlands and riparian vegetation. These impacts would occur directly from placement of the levee footprint as well as indirectly, where levees will alter the hydrology of these areas. The resulting changes in plant communities and physical structure would change the habitat value in the project area. The Corps expects that implementation of the SR-6/Scheuber Ditch mitigation project will compensate for those unavoidable losses, although we have not seen documentation that demonstrates this. We look forward to the establishment of a mitigation workgroup, which would coordinate with the Corps

in negotiating the adequacy of mitigation, the preparation of the mitigation plan, and design of the SR-6/Scheuber Ditch project.

The levees may also cause significant loss of aquatic habitat in those cases where the levees must be located closer than 100 feet to the river channel due to the proximity of roads or other infrastructure. Although 80% of the proposed 80,000 linear feet of new or upgraded levees will be located 300 feet or more from the river, approximately 8,700 feet of levees will be located closer than 100 feet. Impacts to the Chehalis River and its tributaries would include loss of riparian overstory, reduction in large woody debris recruitment, and a reduction in shading and terrestrial prey production. The impacts to fish of these more closely channelized areas could be minimized by incorporating fish benches, large woody debris, and riparian plantings into the levees.

The amount of fill previously placed in the floodplain has been considerable. We have recommended that the local sponsor develop a “no net loss” policy for floodplain filling. The policy would help ensure that if fill is placed in the floodplain, the loss of floodplain function and storage would be mitigated by removal of previously-placed fill. This policy should be crafted so that the goal is restoration of floodplain function and floodplain storage. Examples of this type of mitigation might include removal of piles of fill on the river side of the levees or reconnection of oxbows. The way in which this policy is developed and implemented could make a tremendous difference in restoring flood storage and natural function to the floodplain. We believe that the Corps has an obligation to consider “no net loss” of the floodplain in the construction of the levee system and to evaluate the potential to use previously-placed fill for construction of the levees.

The Corps has stated that it will not consider planting woody shrubs or trees in the levees out of a concern for the structural integrity of the levees. However, we note that in many levee systems in the Pacific Northwest, the Corps has allowed establishment and even planting of woody riparian vegetation. Our understanding is that the proposed levees would not be subject to high energy erosive forces in most cases, so that the structural needs for levees may vary depending upon their location and the forces they would be expected to endure. Riparian plantings and fish benches designed into the levees would provide edge habitat for fish and would be helpful in offsetting some of the negative impacts that would be caused by encroachment on the river.

Provided that further development is limited within the levee system, we believe that setback levees will encourage continued agricultural use of the floodplain. Continued agricultural land use would benefit wintering waterfowl and shorebirds that forage in flooded fields. The setback levees will allow the river to evolve more naturally than it would if increasingly channelized by armoring and hemmed in by further development. Setback levees also provide a foundation for many restoration activities that could be undertaken as part of this flood project or as part of the Chehalis Basin Study, such as wetland, floodplain or riparian restoration and re-connection of off-channel habitat.

Conservation, drainage or erosion easements or purchase or transfer of development rights are an important component of the levee system. Providing an incentive to continue agricultural land use and protection of riparian areas would be of long-term benefit to this area. Because livestock has prevented the establishment of riparian vegetation and trampled the banks in many areas of

the Centralia Reach, these areas should be fenced and riparian vegetation planted. The proposals to include wetland and riparian restoration and re-connection of off channel habitat should include conservation easements or other landowner agreements. These agreements are a critical part of ensuring that the restoration work remains in place long enough to benefit fish and wildlife. Erosion easements would decrease the incidence of future bank armoring.

NONSTRUCTURAL MEASURES

The nonstructural measures as originally proposed by the Interagency Workgroup are an important component of the levee system. Their main effect would be to discourage further urban development of the floodplain area within the levees. Limiting further development of these areas would decrease the degradation caused by filling the floodplain, encroachment of infrastructure on the river, elimination of riparian areas and fill of wetlands. However, the DEIS indicates that commercial development may be allowed to continue. If commercial development and landfill is allowed to continue within the levees, degradation of natural floodplain functions will also continue. All of the nonstructural measures discussed below are important to incorporate into the recommended plan.

1). Adoption of a new regulatory 100 year floodplain.

Land use regulations have allowed development to occur in areas that flood frequently. At least part of the reason for this is that local governments are using outdated FEMA maps showing a very limited extent of flooding. By locating residential and commercial development outside the 100-year floodplain as defined by recent hydraulic modeling, future development will have much less impact on river functions and fish and wildlife habitat and will be at less risk for flood damage.

2). Restrictions or a moratorium on development in the newly defined floodway and flowpaths.

This measure is also an important step in halting the ongoing filling and encroachment. We are concerned that commercial development will be allowed in the newly-defined floodway in both Lewis County and the City of Chehalis.

3). Implementation of a “no net loss” policy for floodplain capacity.

This would require that new fill be mitigated by removal of an equal volume of fill elsewhere in the floodplain or floodway. Our understanding of the intent of a “no net loss” of floodplain policy is that it would help retain floodplain storage, encourage the connection of the river with its floodplain, and provide for natural floodplain functioning. We caution that this policy could easily be misconstrued as to be completely ineffective. A hole excavated in the floodplain, for example, would provide no mitigation of lost capacity (since it would fill with groundwater during flood events) whereas removal of previously-placed fill would actually increase the area of lateral flooding. In addition, excavating a hole to compensate for the placement of fill may create areas where fish

would be trapped and stranded during flood events. This policy needs to be carefully developed so that the original intent is not lost.

Local jurisdictions have policies regarding fill of floodplain areas, but we are uncertain whether these meet the intent of the “no net loss” policy. The Corps has described how a “no net loss” policy could be developed, but it is not clear to what extent it is already met, or whether and how this measure will actually be implemented.

4) Development of a floodplain management plan in compliance with the Executive Order on Floodplain Management 11988.

This is also important because it provides a foundation for land use planning in these frequently flooded areas. The Corps has stated that this measure will be accomplished prior to signing of the cooperative agreement for project implementation. It is uncertain whether resource agencies will have the opportunity to provide input.

5) Stormwater management.

The local sponsor has adopted minimum requirements for new development and redevelopment from the state’s Stormwater Management Manual for Western Washington.

MITIGATION

The SR-6/Scheuber Ditch mitigation proposal is an extremely important part of the levee system. Conceptually, it would appear to mitigate for many of the unavoidable project impacts in the Chehalis River floodplain and would add significant value to fish and wildlife habitat in the project area. It appears to be implementable.

The Corps has indicated that the SR-6/Scheuber Ditch complex will be sufficient to address compensatory mitigation for project impacts as well as provide additional enhancement to fish and wildlife. While we strongly support the SR-6/Scheuber Ditch concept, we are not aware of any discussions or documents that have demonstrated that this mitigation proposal will be adequate to compensate for all project impacts. The Corps needs to convene a mitigation workgroup to negotiate the adequacy of mitigation before further details about the SR-6/Scheuber Ditch proposal are developed.

Many design details need to be developed, but the basic concept, if constructed, would be expected to increase flood storage, reconnect the floodplain with the river hydrology, provide overwintering and possibly summer rearing habitat for salmonids, restore wetlands and riparian habitat, restore an agricultural ditch to stream meandering and restore an area degraded by agricultural ditching and drain tiles. This project would improve floodplain connections, and we also believe it will help restore hyporheic connections and aquifer recharge which could have a small but beneficial influence on base flows and water temperatures.

The Chehalis Indian Tribe has proposed a concept for mitigation/restoration that needs to be explored further. The Tribe has undertaken numerous restoration projects for wild salmonids in the last decade and has a proven program for restoration. They have been successful at leveraging funds to get these projects implemented. The Tribe proposes that as a supplement to the proposed habitat enhancements, dedicated funds be found to provide for a program to restore habitat in the upper watershed for wild salmonids. In the past, mitigation for large federal projects was often in the form of hatcheries or other actions that failed to compensate for project impacts. Many times, impacts went unmitigated because the federal agency had completed its work by the time unforeseen impacts were discovered. The concept proposed by the tribe could be the means by which additional mitigation would be provided or corrective measures taken.

The Corps has committed to developing a mitigation plan during the PED phase of planning. The mitigation plan should be developed in close coordination with a workgroup consisting of resource agencies and tribes. The feasibility of the tribe's proposal (discussed in the paragraph above), the adequacy of proposed mitigation, goals of mitigation, performance standards for measuring success, and a monitoring and adaptive management plan should be developed with that workgroup. Detailed planning and design of the SR-6/Scheuber Ditch mitigation project should also be coordinated with this workgroup.

We recommend that impacts that may occur from dam re-operation in the Skookumchuck River be mitigated within the same sub-basin. We support the Corps in developing sediment and geomorphic studies to determine more carefully what the impacts of dam re-operation will be. Opportunities to minimize impacts from the dam re-operation should be vigorously explored.

RESTORATION

Part of the project purpose for the Centralia Flood Study is to "incorporate appropriate fish and wildlife habitat improvements." In keeping with this purpose, we want to make sure that restoration is a significant part of the proposed project. So far, the Corps has not selected any of the restoration projects from the Draft Restoration Plan (Tetra Tech 2001), for further planning and design, nor has it indicated that it intends to implement any of these restoration projects. Restoration opportunities described in the Tetra Tech report would result in a long-term improvement in conditions. These projects would include large and small-scale riparian plantings, re-connections of oxbows or other off-channel habitats, the addition of large woody debris, and channel roughening, increased floodplain area or function, and restoration of wetlands. In addition to restoration projects proposed in the Tetra Tech report, there are many opportunities in the upper watershed, outside the project area, that if implemented would enhance conditions for fish and wildlife.

One of the recommendations in the Corps' restoration plan was that cut, eroding banks in the Centralia Reach should be sloped back, trees planted, and the toe armored to prevent erosion at the base. We cannot wholeheartedly support toe armoring without understanding more about what is causing the channel incision to occur and how the river is responding to past impacts. Aerial photos indicate that there has been little channel meandering in the last 60 years; the restoration plan implies that toe armoring, therefore, would have little effect on channel migration and that it is needed to get vegetation established on the upper banks of the river. We

are uncertain that toe armoring is indicated. With the level of information available, we are more comfortable with a conservative approach of livestock exclusion, riparian plantings where there is a good chance of establishment, reconnecting oxbows, wetland restoration, and the addition of large woody debris. We believe that ultimately, channel incision in this area will not improve without the accumulation of large wood to help aggradation of the bed.

SKOOKUMCHUCK DAM

Our main uncertainty about the recommended plan lies with dam re-operation and alteration of flows in the Skookumchuck River. The Skookumchuck River is an important spawning area for spring chinook, with 90 % of the spawning in the entire Chehalis basin taking place in the Skookumchuck, Newaukum or Upper Chehalis Rivers. Fall chinook, steelhead, coho, and resident salmonids also spawn, rear and forage in the river. Alteration of flows could have serious implications for these salmonids.

First, we are concerned that rapid evacuation of the reservoir could have impacts on chinook salmon that spawn in the Skookumchuck River. Also, if the reservoir is evacuated late in the rainy season, we are concerned that too little water would remain to provide minimum instream flows for summer months through the fall spawning season to the end of the yearly dry season.

Second, if overbank flows are decreased, it could result in large scale changes in wetlands, riparian vegetation composition and function. Off-channel habitats are somewhat uncommon now in the Skookumchuck River and many are already inaccessible at low flows. With the decrease in frequency of peak flows, these habitats may fill with sediments and vegetation so that they become even less accessible in the future. Decreasing overbank flows would likely result in fewer opportunities for new side channels and off-channel habitats to be formed. Loss of overbank flooding would also reduce the opportunity for fine sediments to be deposited on the floodplain, meaning that they would be passed downstream to fill in gravel or affect salmonids directly. It may also reduce the potential for recruitment of large woody debris into the system.

Channel maintenance flows are extremely important in any river system with spawning salmonids because they cleanse the spawning gravels of fine sediments. Channel maintenance flows usually occur at a 2 to 5 year event (P. Bakke, pers. comm. 5-16-02), but we do not know the flows at which this function occurs in the Skookumchuck River. We are concerned that limiting flows may decrease channel maintenance functions. Shifts in flows would almost certainly create shifts in size classes of substrate, which may change the species that could use that substrate and the channel structure. Altered flows could also result in alterations of pool to riffle ratio, channel structure, floodplain connectivity, recruitment and transport of coarse sediments and large woody debris, and increased channel incision.

Our third concern with the dam modification is with respect to fish passage. The winter steelhead population is depressed. Information about how well the existing dam functions with respect to fish passage is lacking. Our understanding is that studies to determine whether steelhead smolts reach the dam or can survive downstream passage may have been done shortly after the dam was constructed, but that this information is not available currently. The returning steelhead spawners that are trapped and trucked to a release site above the dam are assumed to be progeny of wild

steelhead. However, they may well be progeny of hatchery steelhead that have spawned in the river. We are uncertain whether the trap and haul operation has been successful in producing smolts, or that any smolts produced actually reach the dam, given the assumed level of predation in the reservoir. We are uncertain whether juveniles, smolts or kelts (spawned-out adult steelhead that are returning to the ocean) can survive passage through the dam.

Our support for dam modifications will depend upon the several actions which need to be taken: a) questions about impacts from reservoir evacuation need to be discussed, clarified and resolved in coordination with resource agencies; b) completion of recommended geomorphology and sediment studies that would quantify potential impacts and help development of mitigation projects; and c) a determination of the adequacy of mitigation coordinated with the mitigation workgroup. Where significant uncertainties exist about the magnitude of impacts, our support for the dam modifications will depend upon the Corps' firm commitment to provide: 1) generous mitigation to offset potential impacts; and 2) restoration projects to enhance fish and wildlife habitat. These components should include adequate planning and time for agency participation and input.

We are still concerned about the possibility that the Mellon Street bypass (part of the Lewis County alternative) may appear later as a component of the recommended plan. We will not support the recommended plan if it includes the Mellon Street bypass unless specific geomorphology and sediment studies have been conducted that more definitively demonstrate either that impacts would be insignificant or that quantify potential impacts so that appropriate mitigation may be developed.

RECOMMENDATIONS

1. Consult with the Service and other resource agencies to determine the appropriate time to schedule in water work to decrease impacts to anadromous fish.

Response: *Agree; consultation will be ongoing throughout the life of the project.*

2. Fully implement all features in the design that minimize the impact of the project during the construction and operation as described in the Biological Assessment and NEPA documentation.

Response: *Agree; impacts during construction and operation have been considered throughout the alternative development process.*

3. Remove all man-made debris from the site after construction. Prevent any debris from entering rivers or streams throughout the project's construction.

Response: *Agree; this will be part of the construction contracts when awarded.*

4. The extent of riparian impacts must be minimized and native plantings must replace the lost function provided by any trees and shrubs removed by the construction.

Response: Agree; this will be looked at during the final planning phase of the proposed project and will be implemented where feasible.

5. Identify and protect, to the extent practicable, any existing large trees (in particular, conifers) within the construction site that are also within one site-potential tree height of any rivers or streams. Large trees that need to be removed from the construction site should be pushed over to maintain the root wad and placed in streams or rivers or within the riparian corridor following construction.

Response: Agree; this will be implemented where practicable during construction.

6. Refuel all machinery at least 300 feet back from wetlands or streams and identify sites suitable for refueling activities prior to commencing construction.

Response: Agree; this will be part of the environmental section of each contract.

7. Adhere to the Washington Department of Ecology's Water Quality Certification, when issued for the project.

Response: Agree; the Corps is required to adhere to the water quality certification guidance and directions.

8. An environmental monitor should conduct a site inspection prior to construction and should be present on site as often as needed to assure that actions to minimize impacts are followed. Protocols and contingencies for this person to follow should be provided in the monitoring and adaptive management plan.

Response: Disagree; the Corps believes that all necessary inspections will be concluded prior to construction and there would be no need to have an environmental monitor on site during construction. The project PM will be ultimately responsible for all construction activities and will ensure that all actions minimize impacts to the environment. In the event a situation arises that an environmental person is required on site the Corps will provide that person. However, the Corps agrees that a monitoring and adaptive management plan should and will be developed prior to construction.

9. All spoil areas should be identified prior to project construction to provide resource agencies the opportunity to assess impacts and recommend restoration measures.

Response: Agree; the Corps will work with the resource agencies during all phases of this project.

10. Sites of construction activities such as access roads, staging areas, borrow pits, etc., should be kept as small as possible in order to minimize disturbance and destruction of terrestrial wildlife habitat. Furthermore, the construction phase should also be as short as possible to reduce potential disturbance to fish and wildlife.

Response: *Agree; the Corps will implement those procedures during construction.*

11. The Corps should convene a “mitigation workgroup” composed of the Service and affected resource agencies and tribes. The mitigation workgroup would help the Corps determine the adequacy of mitigation for project impacts and participate in the development and completion of the following tasks:

a. Geomorphic and sediment studies on the Skookumchuck River. The intent of these studies is to determine the significance of and quantify the potential impacts of altering flows on spawning gravels, bed and bank scour, channel incision, off-channel habitat, riparian habitat, wetlands and other concerns that may be raised. These studies would be used in determining and planning mitigation actions to avoid, minimize and compensate for project impacts.

The Corps should consider a sediment effectiveness analysis to determine the competence of various flows to move sediment sizes in the Skookumchuck River. This analysis would help to determine the flows at which channel maintenance takes place now, the changes likely to occur with alterations in flows, and the significance of the project impacts to the channel and sediment routing post-project.

b. Wetland and terrestrial habitat studies. The Corps should coordinate with the workgroup to determine the adequacy of studies conducted so far to quantify impacts to wetlands and terrestrial vegetation. A wetland functional analysis and field verification of delineation may need to be conducted to more accurately quantify impacts to wetlands. In addition, the Corps may need to conduct a habitat evaluation program (HEP) to help quantify impacts to terrestrial habitat and selected species depending upon it.

c. Preparation of a Mitigation Plan. The intent of the mitigation plan is to quantify (where possible) the impacts of levees and dam re-operation on the Chehalis and Skookumchuck River systems; propose mitigation actions that will avoid, minimize and compensate for project impacts; and finally, to develop biological goals and objectives for the mitigation projects. Performance measures should also be developed that would be used in determining whether those goals were met or not. The mitigation plan should provide a justification for what is being proposed as mitigation and show how implementation would offset project impacts. Project impacts need to be mitigated within the same basin that they occur.

d. Monitoring and Adaptive Management Plan. The Corps needs to develop a monitoring and adaptive management plan that contains implementation and effectiveness components to ensure that the proposed project and mitigation actions are being implemented as described in Corps documents and that the biological goals of mitigation are being met. The adaptive management component is important so that corrective actions can be taken or additional mitigation provided in the event that changes have been or must be made to project operation, mitigation is not successfully offsetting impacts, or impacts are discovered to be greater than originally assumed. The monitoring plan should specify how this implementation and effectiveness monitoring should be done, who will

do it, appropriate review intervals, who and how reviews will take place, and how changes in mitigation or project operation should be negotiated.

e. Operation of Skookumchuck Dam. The Corps needs to coordinate closely with affected agencies and the tribes about how the dam will be operated for flood control. We are concerned with how quickly the reservoir will be evacuated for flood control and whether water evacuated very late in the season will be unavailable to provide minimum instream flows for salmonids during the summer.

Questions that remain unanswered should be addressed in this group, including the presence and functionality of fish screens on the power plant intakes and the success of fish passage past the dam and other issues as yet to be raised. The Corps should work with these agencies to ensure that management plans for the dam re-operation do not compromise existing fish passage at the dam, preclude improvements in fish passage for the future, or conflict with future restoration actions in the Skookumchuck River.

f. Design details need to be formalized on the SR-6/Scheuber Ditch mitigation project. Among the issues that need better clarification are: identifying the flows needed for connection with the oxbow and bypass floodway, ways to minimize fish loss due to stranding, entrapment and predation, and anticipated maintenance needs, among other issues that may be identified.

Response: *Agree; the Corps will utilize the original working group that produced the restoration protocol for the mitigation work group. This group well represents all agencies and tribes that may be affected by this project. The Corps has already implemented many of the comments listed above as the agency continues to work with the work group in the early stages of this project.*

12. Project monitoring and adaptive management should be undertaken for a minimum of ten years, with the provision to adjust the monitoring period to reflect the degree of project uncertainty.

Response: *Agree; this will be part of the monitoring plan when developed.*

13. Issues that should be monitored include, but are not limited to, fish passage at the dam, functioning of restoration and mitigation projects, and alterations to downstream habitats resulting from changes in flows released from the dam, including spawning gravels, bed and bank scour, off channel habitats, wetlands and riparian areas.

Response: *Agree; this will be part of the monitoring plan when developed.*

14. The Corps should consider incorporating riparian vegetation, fish benches, and large woody debris into the design of the setback levees, particularly in areas where the levees will be located closer than 100 feet to the river. We believe that these measures could offset some of the impacts associated with loss of riparian vegetation, edge habitat for fish, shade, and low velocity refuge for fish.

Response: *Disagree; the Corps maybe able to incorporate vegetation between the levee and the river but will not be able to place vegetation on the levee, as that would reduce the levee's stability.*

15. As part of the cooperative agreement for project implementation, the Corps should require the local sponsor to coordinate with the resource agencies and tribes in the development of the floodplain management plan. The plan should be fully implemented within three years after completion. Commercial development riverward of the levees should be specifically prohibited.

Response: *Disagree; a moratorium on developments is not within the regulatory jurisdiction of this agency.*

16. The Service should be funded during the next project phase so that we can continue to participate in the review of the updated project plans and design, the mitigation plan, the monitoring and adaptive management plan, and to help resolve any remaining fish and wildlife issues on a timely basis.

Response: *Agree; the Corps intends to fund the Service with Fish and Wildlife Coordination Act funds for as long as feasible.*

17. The Corps needs to commit more actively to restoration as an important component of the project purpose. The project purpose as stated in the DEIS is, "to reduce flood hazards to the study area. and to incorporate appropriate fish and wildlife habitat improvements." We recommend that the Corps select restoration projects from the Draft Restoration Plan for further development in addition to the SR-6/Scheuber Ditch mitigation project.

Response: *Agree; the Corps can and probably will recommend a number of restoration projects associated with this project; however, restoration is funded like any other civil works project in that it's a cost share agreement. The sponsor must have the funds in order to implement restoration projects.*

18. All recommendations presented in the Corps' fisheries review document should be incorporated into the dam re-operation plan and the revised rule curve for the Skookumchuck Dam with the following exceptions or additions:

- a) because the formation of new or maintenance of existing off-channel habitats along the Skookumchuck River may be diminished with the flood control project, the Corps should enhance existing off channel habitats and wetlands along the Skookumchuck River; and
- b) alterations to the dam need to include safe downstream passage for juveniles, smolts, and kelts, (i.e., adult steelhead that return to the ocean after spawning). Effective upstream fish passage needs to be assured.

Response: *Disagree with a. The Corps will evaluate the potential of the project adversely affecting off channel habitat and will at that point make a determination whether mitigation is required based on those findings. Agree with b.*

19. The Corps should obtain an evaluation by a geomorphologist to determine the potential for avulsion across the SR-6 bypass and the potential impacts should that occur.

Response: *Agree.*

20. The Corps should consider restoration actions outside of the project area in other parts of the watershed. In some cases, opportunities in the upper watershed can potentially provide better enhancement potential than those within the project area. This concept should be discussed by the mitigation workgroup during the next phase of planning.

Response: *Agree; the Corps agrees that this concept should be discussed further by the work group before any attempts are made to consider restoration projects outside the project area.*

21. The Corps should evaluate areas where fill has been previously placed to determine the feasibility of using this material for construction of the levees. Incorporating previously-placed fill into the levee construction would help restore flood storage and natural floodplain function to the Centralia Reach.

Response: *Agree; the Corps will attempt to use any and all available fill that will meet the criteria for levee construction for this project.*

SUMMARY

We appreciate the direction the Corps has taken with this project and the coordination done in selection of the least environmentally damaging alternative. We support the concept of the setback levees. However, the short planning timeline for this project has meant that many details we had hoped would be finalized by now are yet to be developed.

First, we are concerned about how well nonstructural measures will actually contribute to the protection of natural floodplain functions on the river side of the levees. If nonstructural measures do little to restrict further commercial development and fill of the floodplain, then one of the major benefits of the setback levee approach, i.e., natural floodplain function, would be limited.

Second, the Corps has not coordinated with resource agencies and tribes to determine the adequacy of mitigation to compensate for project impacts. The Corps has proposed the SR-6/Scheuber Ditch mitigation project, which we support, but has not demonstrated that it alone is sufficient as mitigation. In addition, many details remain to be developed about how it would function.

Third, we do not yet know specifics about the impacts that could occur from altering flows in the Skookumchuck River, nor are we certain about how these would be mitigated. We would not support mitigation for those impacts in a different basin. The Corps has indicated that geomorphic and sediment studies will commence to help determine the significance of these impacts in the Skookumchuck River, but we have not participated in the scoping or planning of these studies.

Fourth, although the project purpose identifies habitat enhancement as an important part of the project, the Corps has not selected any restoration projects above and beyond the SR-6/Scheuber Ditch mitigation proposal. It has not indicated that it will undertake additional restoration.

Finally, the Corps has not yet discussed details about monitoring and adaptive management with our agency or other resource agencies. This is a huge project with many potential impacts. Assumptions have been made about the magnitude of impacts that we are not certain are correct. The short timeline has meant that many contingencies have not been well thought out. A few years from now, we may discover that the project needs to be operated differently for flood control, or that mitigation sites are not functioning well, or that impacts are much greater than predicted. We need to have the ability to take corrective actions should they be necessary.

We want to be sure that the issues described above are addressed with sufficient detail and clarity to alleviate our concerns about potential impacts. Accordingly, we are recommending that the Corps convene a mitigation workgroup, composed of the Service, affected resource agencies and the tribes, to participate in the development of these plans and studies. Our support for the proposed project will depend upon the quality of the plans described above, the commitment to their implementation, and the degree to which the Corps coordinated with others while developing them.

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[End of Final FWCAR]

[End of Chapter 9, Comments and Responses to DEIS]

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12. GLOSSARY OF ACRONYMS, ABBREVIATIONS AND TERMS

12.1 GLOSSARY OF ACRONYMS AND ABBREVIATIONS

BA	Biological Assessment
BNSF	Burlington Northern Santa Fe
BOD	Biological Oxygen Demand
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
dB	decibel scale
DEIS	Draft Environmental Impact Statement
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
ESA	Endangered Species Act
° C	degrees Celsius
° F	degrees Fahrenheit
FAC	Flood Action Council
FCZD	Flood Control Zone District
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FWCA	Fish and Wildlife Coordination Act
GMA	Growth Management Act
gpd	gallons per day
GRR	General Reevaluation Report
HAZMAT	Hazardous Material
HTRW	Hazardous Toxic and Radioactive Waste

IUGA	Interior Urban Growth Area
LWD	Large Woody Debris
mg/L	milligrams per liter
NAAQS	National Ambient Air Quality Standards
NED	Nationally Economic Development
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NHRP	National Register of Historic Places
NMFS	National Marine Fisheries Service
NO	nitrous oxide
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
PacifiCorp	Scottish paper
PCE	tetrachloroethylene
PED	Preconstruction Engineering Design
PFP	Probable Failure Point
PIE	Pacific International Engineering
PMF	Probable Maximum Flood
PNP	Probable non-failure Point
PSE	Puget Sound Energy
PUD	Public Utilities Division
RM	River Mile
ROG	Reactive Organic Gases
SARA	Superfund Amendments Reauthorization Act
SR	State Route
SHPO	State Historic Preservation Act
SWCAA	Southwest Clean Air Agency
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbons
TN	Total Nitrogen
TP	Total Phosphorus
TPI	Total Personal Income
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Carbons

WAC	Water Quality Standards Surface Water Washington State
WDFW	Washington Department of Fish and Wildlife (formerly Washington Department of Fish (WDF)
WDOE	Washington Department of Ecology
WRDA	Water Resource Development Act
WSDOT	Washington Department of Transportation
WWTP	Waste Water Treatment Plant

12.2 GLOSSARY OF TERMS

A

Acre-feet: The volume of 1 foot of water over the area of 1 acre. 325,872 gallons.

Adsorption: The adhesion of a thin layer of molecules to the surfaces of solid bodies or liquids with which they are in contact.

Affected environment: A physical, biological, social, and economic environment within which human activity is proposed.

Alternatives: The different means by which objectives or goals can be attained. One of several policies, plans, or projects proposed for decision making.

Anadromous: Those species of fish that mature in the sea and swim up freshwater rivers and streams to spawn. Salmon, steelhead, and searun cutthroat trout are examples.

Aquatic: Growing, living in, frequenting, or taking place in water; in this EIS, used to indicate habitat, vegetation, and wildlife in freshwater.

Aquifer: A zone, stratum, or group of strata acting as a hydraulic unit that stores or transmits water in sufficient quantities for beneficial use.

Areal: the spatial extent or location.

Artifact: An object made or modified by humans.

Attenuate: To lessen the amount, force, or magnitude of something, i.e., floodflow.

B

BA: See Biological Assessment.

Background: (scenic distance zone.) The distant part of a landscape. The seen or viewed area located more than four miles from the viewer, and generally as far as the eye can detect objects.

Base Flow: A sustained or fair-weather flow of a stream.

Baseline data: Data gathered prior to proposed action to characterize pre-development site conditions.

Berm: A mound or wall of earth, usually with sloping sides.

Best management practices (BMP): Management actions that are designed to maintain water quality by preventative rather than corrective means.

Big game: Large animals hunted, or potentially hunted, for sport. These include animals such as deer, bear, elk, moose, bobcats, and mountain lions.

Biological Assessment (BA): Refers to the information prepared by or under the direction of the federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the action area and the evaluation of potential effects of the action on such species and habitat.

Biological Opinion (ESA): A document that states the opinion of the U.S.D.I. Fish and Wildlife Service as to whether or not the federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Biostimulatory nutrients: Substances that promote growth, usually of algal or other unicellular species, within a system by providing an excess of nutrients, which are limited under normal conditions. This commonly reduces available oxygen in a system, resulting in adverse effects on other organisms in the same system. Biostimulatory nutrients are commonly components of fertilizers, manures and silage.

C

CADD: Computer Assisted Drafting and Design.

Canopy: The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody debris.

CFR: Code of Federal Regulations. A codification of the general permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

cfs: Cubic feet per second; 1 cfs equals 448.33 gallons per minute.

Channel morphology: The dimensions and composition of a stream or river channel.

Char: Any of a genus (*Salvelinus*) of small-scaled trout with light-colored spots.

Climax plant communities: The stabilized plant community on a particular site. The plant cover does not change so long as the environment remains the same.

Climax species: Those species that dominate a climax stand in either numbers per unit area or biomass.

CMP: Corrugated metal pipe; culverts used in road/stream crossings.

Confluence: the place of meeting of two streams or the combined stream formed by conjunction.

Cover: Living or non-living material (e.g., vegetation) used by fish and wildlife for protection from predators, to ameliorate conditions of weather, or reproduce. The proportion of the ground occupied by a perpendicular projection to the ground from the outline of the aerial parts of the members of a plant species.

Criteria: Data and information, which are used to examine or establish the relative degrees of desirability among alternatives or the degree to which a course of action meets an intended objective.

Cultural resources: The remains of sites, structures, or objects used by humans in the past, historic or prehistoric. More recently referred to as heritage resources.

Cumulative effects or impacts: Cumulative effect or impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taken place over a period of time (40 CFR 15089.7)

CY: Cubic yard.

D

dbA: Decibel scale, A-weighted to mimic the human ear.

Density: The number of individuals in a given area. Expressed per unit area.

Detrital: Loose material (soil, plant particles or other organic particles) that results directly from disintegration or decay.

Dike: An embankment to contain or convey water.

E

Ecosystem: An interacting system of organisms considered together with their environment; for example aquatic, marsh watershed, and lake ecosystems.

Effects: “Effect” and “impact” are synonymous as used in this document. Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes

in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Endangered Species: Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Environment: The physical conditions that exist within the area that will be affected by a proposed project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance. The sum of all of the external conditions that affect an organism or community to influence its development or existence.

Environmental impact statement (EIS): An analytical document prepared under the National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA) that portrays potential impacts to the environment of a Proposed Action and its possible alternatives. An EIS is developed for use by decision makers to weigh the environmental consequences of a potential decision.

Environmental Protection Agency (EPA): An agency of the Executive Branch of the federal government, which has responsibility for environmental matters of national concern.

Ephemeral stream: A stream or portion of a stream that flows only in direct response to precipitation or snow melt. Such flow is usually of short duration.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geologic agents, including gravitation creep.

ESU: Evolutionarily Significant Unit. A delineation of distinct populations of a species, used for determining population status apart from the species as a whole.

F

FEMA: Federal Emergency Management Agency

Fisheries Habitat: Streams, lakes, and reservoirs that support fish populations.

Floodplain: The lowland and relatively flat area adjoining inland waters, including, at a minimum, that area subject to a 1 percent or greater chance of flooding in any given year.

Fluvial: Of or relating to a stream or river.

Forage: All browse and non-woody plants that are available to livestock or game animals for grazing or harvestable for feed.

Forb: Broad-leafed, small plants composed of soft tissue, not woody material. Any herb other than grass.

Foreground: (scenic distance zone) A term used in scenic resource management to describe the area immediately adjacent to the observer, usually within ¼ to ½ mile.

fps: Feet per second, a measure of velocity, or speed.

Freeboard: Vertical distance above water surface elevation to top elevation of manmade or natural containment, such as stream banks, levees, dams, etc.

Freshet: A large increase in stream flow due to heavy rains or snowmelt.

FWS: Fish and Wildlife Service (U.S. Department of the Interior). Also, USFWS.

G

Game Species: Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fisherman under state or federal laws, codes and regulations.

Geomorphic: Pertaining to the form of the surface of the earth.

Glacial till: Glacial materials deposited directly by ice with little or no transportation by water.

Glide: A portion of the stream where stream surface flow does not have increased turbulence resulting from flow interception with submerged obstructions during low flow conditions. A glide is differentiated from a pool by the relatively uniform streambed gradient and lack of a hydraulic control at the downstream end.

GMA: Growth Management Act. An Act of the Washington State Legislature to plan and control economic growth (RCW 43.330.120)

gpd, gph, gpm: Gallons per day, gallons per hour, gallons per minute.

Grass/forb: An early forest successional stage where grasses and forbs are the dominant vegetation.

Groundwater: Water found beneath the land surface in the zone of saturation below the water table.

GRR: General Reevaluation Report.

Guideline: An indication or outline of policy or conduct; i.e., any issuance that assists in determining the course of direction to be taken in any planned action to accomplish a specific objective.

H

Habitat capability: The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish or plant population. It is measured in terms of potential population numbers. Often called carrying capacity.

Habitat: The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions. The place where an organism lives.

Hazardous waste: A waste is considered hazardous by the EPA if it exhibits one or more of these characteristics: ignitability, corrosivity, reactivity, and/or toxicity. These are listed in 40 CFR 261.3 and 40 CFR 171.8.

HAZMAT: Related to hazardous materials.

HEC-RAS: A computer model used to simulate flows during various events, including floods, storms and drought conditions.

Howell-Bunger valve: A fixed-cone valve that discharges water in a radial pattern, designed to pass a controlled amount of water without damage to the immediate environment.

HTRW: Hazardous, Toxic and Radioactive Waste,

Hydraulic: Relating to water or other liquid in motion.

Hydric soils: Soils exhibiting properties that are characteristic of frequent prolonged inundation. Characteristics include mottled coloration, presence of reduced metals, presence of sulfur compounds or high percentage of organic materials.

Hydrograph: A graph depicting flows over time.

Hydrology: The distribution and circulation of water.

I

Incidental take (ESA): Refers to takings that result from, but are not for the purpose of, carrying out an otherwise lawful activity conducted by an agency or applicant.

Incised: A narrow, steep-walled valley caused by erosion.

Infiltration: The movement of water or some other fluid into the soil through pores or other openings.

Intermittent stream: A stream that runs water in most months, but does not contain water year round.

Interstitial: Occupying the spaces between sediment particles.

Inundate: Cover with water.

L

Landscape: The sum total of the characteristics that distinguish a certain area on the earth's surface from other areas. These characteristics are a result not only of natural forces but also of human occupancy and use of the land. An area composed of interacting and interconnected

patterns of habitats (ecosystems) that are repeated because of geology, landforms, soils, climate, biota, and human influences throughout the area.

Ldn: Day-Night Sound Level measurement descriptor of total outdoor noise environment

Levee: An embankment for preventing flooding.

Listed Species (ESA): Species that are listed as threatened or endangered under the Endangered Species Act of 1973 (as amended).

Lithic: Of relating to, or being a stone tool.

LWD: Large Woody Debris. Usually refers to woody material greater than 12 inches in diameter 25 feet from the base end of the log, within a stream channel. Upland large woody debris is often considered **Coarse Woody Debris**.

M

Mitigation: Reduction or reversal of an effect. For the purposes of this document, mitigation is design, planning or construction phases used to reduce, minimize or account for effects of a project on the environment, economy and population. Mitigation includes; (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or elimination of the impact over time by preservation and maintenance of operations during the life of the action; and, (e) compensating for the impact by replacing or providing substitute resources or environments (40 CFR Part 1508.20).

N

NAAQS: National Ambient Air Quality Standards.

NFIP: National Flood Insurance Program.

Non-game species: Animal species that are not hunted, fished, or trapped.

NOx: Nitrogen Oxides

NPDES: National Pollutant Discharge Elimination System – A program authorized by Sections 318, 402 and 405 of the Clean Water Act, and implemented by regulations 40 CFR 122. NPDES program requires permits for the discharge of pollutants from any point source into waters of the United States.

NRHP: National Register of Historic Places;

O

OAHP: Office of Archaeology and Historic Preservation (Washington State).

Objective: A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

Ogee: (Ogee spillway, Ogee crest) The work ogee describes the shape of the curve, in profile, on the crest of the spillway or dam. The shape is a reverse curve, similar to the letter “s”.

Overtopping: Water surface elevations in exceedance of the elevation of manmade or natural containment, such as stream banks, levees, dams, etc.

Oxbow: (Oxbow lake) For the purposed of this document, an oxbow is a curved portion of a former channel that has been isolated from the main channel by bank erosion and remains in the floodplain, usually as a wetland or pond.

P

Passerine bird: Of or relating to the largest order (Passeriformes) of birds, consisting chiefly of songbirds of perching habits.

Percolation/infiltration: The act of water seeping or filtering thorough the soil without a definite channel.

Perennial stream: A stream that flows year round.

pH: Symbol for the negative common logarithm of the hydrogen ion concentration (acidity) of a solution. The pH of 7 is considered neutral. The pH number below 7 indicates acidity, and a pH value above 7 indicates alkalinity or a base.

PHS: Priority Habitats and Species. Priority species are defined by the State of Washington as species that require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. A priority habitat may consist of a unique vegetation type or dominant plant species, successional stage, or structural element.

Plant communities: A vegetation complex unique in its combination of plants which occurs in particular locations under particular influences. A plant community is a reflection of integrated environmental influences on the site such as soils, temperature, elevation, solar radiation, slope aspects, and precipitation.

PM10: Particulate matter less than 10 microns in diameter.

PMF: Probable Maximum Flood.

Pool: A portion of the stream with reduced surface turbulence and a hydraulic control at the downstream end. Pools often have a bowl appearance resulting from high-flow scour.

ppm: parts per million.

Project: The whole of an action, which has a potential for resulting in a physical change in the environment. An organized effort to achieve an objective identified by location, timing, activities, outputs, effects, and time period and responsibilities for executions.

Proposed action: A description of the project as proposed by a project proponent in a plan of operations.

Public participation: Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about planning.

Public scoping: Giving the public the opportunity for oral or written comments concerning the intentions, activity, or influence of a project or an individual, the community, and/or the environment.

R

Raptor: Bird of prey, including eagles, hawks, falcons, and owls.

RCRA: Resource Conservation Recovery Act.

RCW: Revised Code of Washington.

Recharge: Absorption and addition of water to the zone of saturation.

Riffle: A portion of the stream where stream flow is intercepted by partially or completely submerged obstructions to produce increased surface turbulence and flow velocities during low flow conditions.

Riparian zone: Terrestrial areas where the vegetation and microclimate are influenced by perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics; this habitat is transitional between true bottomland wetlands and upland terrestrial habitats.

Riparian: A type of ecological community that occurs adjacent to streams and rivers and is directly influenced by water. It is characterized by certain types of vegetation, soils, hydrology, and fauna and requires free or unbound water or conditions more moist than that normally found in the area.

Riverbed: The bottom of a river channel.

RM: River Mile. Distance upstream in statute miles from a zero benchmark established at the river mouth.

ROG: Reactive Organic Gases.

Rule curve: Operations procedures for flood control structures are designed to maintain reservoir elevations and downstream flows that vary throughout the year to meet biological and

economic needs. Illustrating these flows in a graph depicting flow volume over time results in a curve, the “rule curve”.

Runoff: Precipitation that is not retained on the site where it falls, not absorbed by the soil; natural drainage away from an area.

S

Salmonid: Any of a family (Salmonidae) of elongate bony fishes (as a salmon or trout) that have the last three vertebrae upturned.

Scour: For the purposes of this document, scour is the erosional effect of flowing water and suspended material on the stream channel.

Sensitive species: Plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official state list, or that are recognized by the state as needing special management to prevent placement on federal or state lists.

SEPA: State Environmental Policy Act.

Setback: For the purposes of this document, setback describes the distance between a flood control structure and the associated stream bank.

Short-term impacts: Impacts occurring during project construction and operation, and normally ceasing upon project closure and reclamation. Each resource, by necessity, may vary in its definition of short-term.

Significant: Requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts. The severity of an impact should be weighted along with the likelihood of its occurrence.

Sluice: An artificial passage for water (as in a dam) fitted with a valve or gate for stopping or regulating flow.

Snag: A standing dead tree from which the leaves and most of the branches have fallen.

Socioeconomic: Pertaining to, or signifying the combination or interaction of social and economic factors.

Spillway: A passage for surplus water to run over or around an obstruction (as a dam).

Stand Diversity: Any attribute that makes one timber stand biologically or physically different from other stands. The difference can be measured by, but not limited to, different age classes, species, densities, or non-tree floristic composition.

Stream gradient: The rate of fall or loss of elevation over the physical length of a segment or total stream usually expressed in ft/ft (percent).

SWCAA: Southwest Clean Air Agency

T

Tainter gate: A gate designed to open or close by rotating on an axle in an arc perpendicular to the flow.

Talus: Heaps of coarse debris at the foot of cliffs and steep slopes resulting from gravity transport and weathering processes.

Terrestrial: Of or relating to the earth, soil, or land; an inhabitant of the earth or land.

Threatened species: Those plants or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future.

Transect: A sample area in the form of a long narrow continuous strip that is used for the tabulation of data.

Turbidity: Reduced water clarity resulting from the presence of suspended matter.

U

Understory: A foliage layer lying beneath and shaded by the main canopy of a forest.

USACE: United States Army Corps of Engineers; agency responsible for regulating and permitting wetland disturbances..

USDA: United States Department of Agriculture.

USFWS: United States Fish and Wildlife Service – United States Department of Interior.

USGS: United States Geological Survey – United States Department of Interior.

V

Velocity: Rate of speed along a straight line. For the purposes of this document, velocity refers to the speed of flow.

W

Water quality: The interaction between various parameters that determines the usability or non-usability of water for onsite and downstream uses. Major parameters that affect water quality

include: temperature, turbidity, suspended sediment, conductivity, dissolved oxygen pH, specific ions, discharge, and fecal coliform.

Watershed: The entire land area that contributes water to a particular drainage system or stream.

Weir: A dam in a stream or river to raise the water level or divert its flow; a fence or enclosure set in a waterway for isolating and removing fish.

Wetlands (Biological Wetlands): Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, etc.